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THE
NEW GRESHAM
ENCYCLOPEDIA
VOLUME VIII

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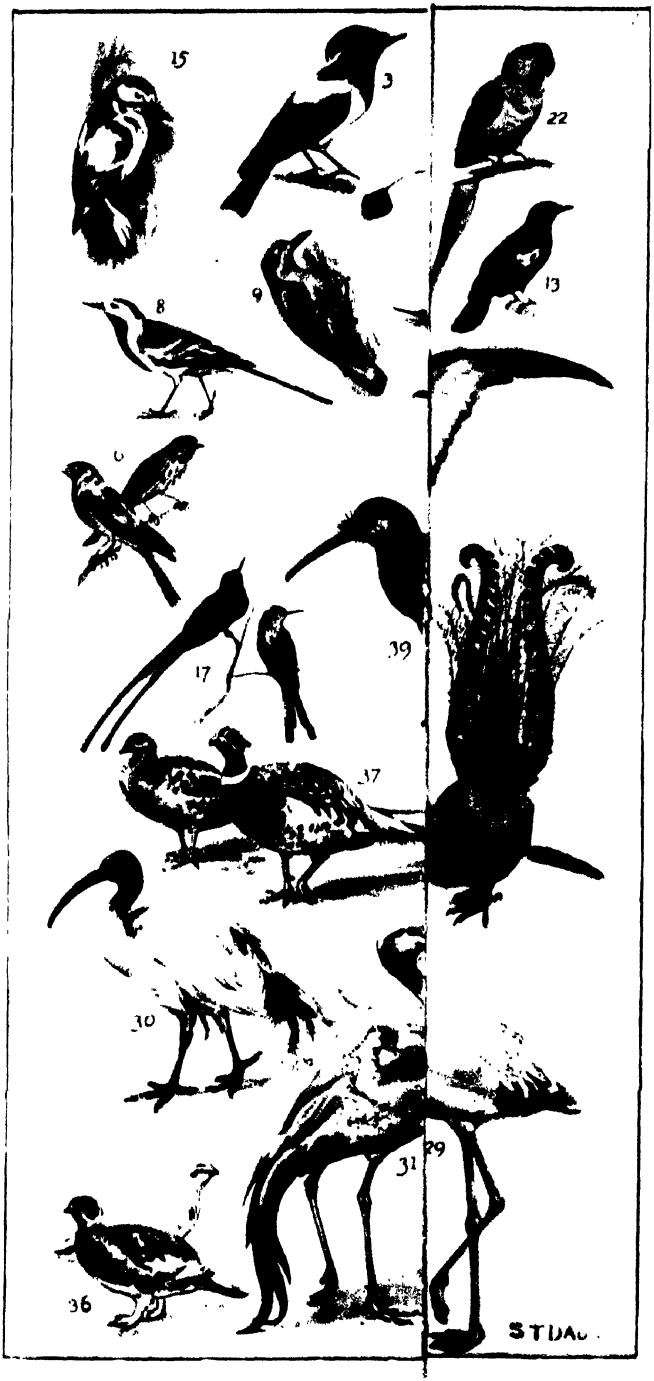
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THE
NEW GRESHAM
ENCYCLOPEDIA

VOLUME VIII

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KEY TO PRONUNCIATION

The method of marking pronunciations here employed is either (1) by marking the syllable on which the accent falls, or (2) by a simple system of transliteration, to which the following is the Key:—

VOWELS

ā, as in f*a*te, or in b*a*re.

ä, as in *a*lms, Fr. *â*me, Ger. B*a*hn=ä of Indian names.

ȧ, the same sound short or medium, as in Fr. b*a*l, Ger. M*a*nn.

a, as in f*a*t.

a̤, as in f*a*ll.

a, obscure, as in rur*a*l, similar to *u* in b*u*t, ė in h*e*r: common in Indian names.

ē, as in m*e*=*i* in mach*i*ne.

e, as in m*e*t.

ė, as in h*e*r.

ī, as in p*i*ne, or as *ei* in Ger. m*ei*n.

i, as in p*i*n, also used for the short sound corresponding to ē, as in French and Italian words.

eu, a long sound as in Fr. j*eû*ne=Ger. long *ö*, as in S*ö*hne, G*ö*the (Goethe).

eu, corresponding sound short or medium, as in Fr. p*eu*=Ger. *ö* short.

ō, as in n*o*te, m*oa*n.

o, as in n*o*t, s*o*ft—that is, short or medium.

ö, as in m*o*ve, tw*o*.

ū, as in t*u*be.

u, as in t*u*b: similar to ė and also to *a*.

ṳ, as in b*u*ll.

ü, as in Sc. ab*u*ne=Fr. *û* as in d*û*, Ger. *ü* long as in gr*ü*n, B*ü*hne.

u̇. the corresponding short or medium sound, as in Fr. b*u*t, Ger. M*ü*ller.

oi, as in *oi*l.

ou, as in p*ou*nd; or as *au* in Ger. H*au*s.

CONSONANTS

Of the *consonants*, **b**, **d**, **f**, **h**, **j**, **k**, **l**, **m**, **n**, **ng**, **p**, **sh**, **t**, **v**, **z**, always have their common English sounds, when used to transliterate foreign words. The letter **c** is not used by itself in re-writing for pronunciation, **s** or **k** being used instead. The only consonantal symbols, therefore, that require explanation are the following:—

ch is always as in ri*ch*.

d, nearly as *th* in *th*is=Sp. *d* in Ma*d*rid, &c.

g is always hard, as in *g*o.

h represents the guttural in Scotch lo*ch*, Ger. na*ch*, also other similar gutturals.

ṇ, Fr. nasal *n* as in bo*n*.

r represents both English *r*, and *r* in foreign words, which is generally much more strongly trilled.

s, always as in *s*o.

th, as *th* in *th*in.

th, as *th* in *th*is.

w always consonantal, as in *w*e.

x=ks. which are used instead.

y always consonantal, as in *y*ea (Fr. *ligne* would be re-written lēny).

zh, as *s* in plea*s*ure=Fr. *j*.

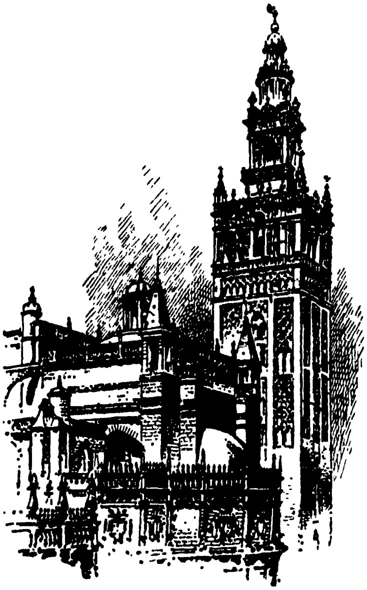
THE NEW GRESHAM ENCYCLOPEDIA

VOLUME VIII

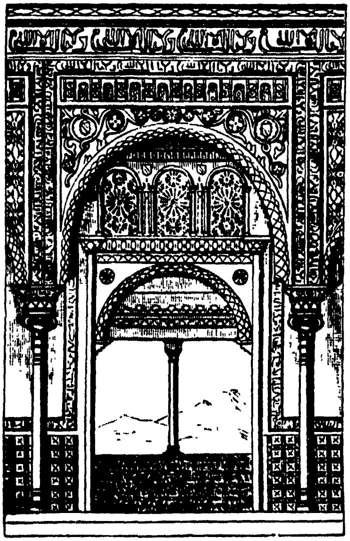
Moore, Sir John, British soldier, was born at Glasgow in 1761, killed at Corunna in 1809. Having obtained an ensign's commission in the 51st Regiment, he served at Minorca, in the American War, as brigadier-general in the West Indies (1795), in Ireland during the rebellion of 1798, in Holland in 1799, and in Egypt in 1801, where he was severely wounded in the battle which cost Sir Ralph Abercrombie his life. Moore was now regarded as the greatest living British general, and in 1805 he was knighted. In 1808 he was appointed commander-in-chief of the British army in Portugal to operate against Napoleon. He advanced to Salamanca in spite of the gravest difficulties, but was finally compelled to retreat to Corunna, a distance of 200 miles, in face of a superior force. This he accomplished in a masterly manner; but the absence of the fleet to receive his army forced him to a battle against Marshal Soult, in which Moore fell, mortally wounded, in the hour of victory (16th Jan., 1809).

Moore, Thomas, Irish poet, was born in 1779 in Dublin, where his father was a grocer, died near Devizes in 1852. From Trinity College, Dublin, he passed in 1799 to the Middle Temple in London, nominally to study law; but he almost immediately entered fashionable society, and in 1800 he was permitted to dedicate his *Translation of the Odes of Anacreon* to the Prince of Wales. His next venture, the *Poetical Works of the late Thomas Little*, though partly written in a licentious vein, which he afterwards regretted, increased his reputation. In 1807 Moore agreed to write words for a number of Irish national airs, arranged by Sir John Stevenson. In these *Irish Melodies*, which were not finished till 1834, he found the work for which his genius was peculiarly fitted. With *The Intercepted Letters, or the Twopenny Post Bag, by Thomas Brown the Younger* (1812), Moore entered upon the field of political and social satire, in which his wit and playfulness found good account; other works of this kind are the *Fudge Family in Paris* (1818), *Rhymes on the Road* (1823), *Memoirs of Captain Rock* (1824), &c. His most ambitious work, the Eastern romance of *Lalla Rookh*, was published in 1817, and brought its author £3000. The *Life of Sheridan* was produced in 1825, and *The Epicurean*, a prose romance, in 1827. Next came the *Life of Lord Byron*, for which he received nearly £5000, and the *Life of Lord Edward Fitzgerald*. His remaining works include: *The Summer Fête*, a poem; *Travels of an Irish Gentleman in search of a Religion*, a serious apology for Roman Catholicism; and (in 1834) a *History of Ireland* for *Lardner's Cyclopædia*, an uncongenial task-work, never finished.—BIBLIOGRAPHY: S. Gwynne, *Thomas Moore*; Charles Kent, *Poetical Works of Moore*; J. P. Gunning, *Thomas Moore, Poet and Patriot*; Earl Russell (editor), *Memoirs, Journal, and Correspondence of Moore*.

Moorish Architecture is that form of Saracenic architecture which was developed by the Moslem conquerors of Spain in building their mosques and palaces. Its main characteristics are: the horse-shoe arch, varied by the trefoil, cinquefoil, and other forms of arch; profuse decoration of interiors by elaborately designed arabesques in low relief, enriched by colours and gilding, as well as by geometrical designs worked in mosaics of glazed tiles; the slenderness of the columns in proportion to the supported weight; and the curious stalactitic pendentives by which the transition is effected from the rectangular ground plan to the arched or domed roof. An important specimen of this style is the mosque of Cordova, now the cathedral, which was begun by Caliph Abd-el-Rahman (A.D. 786), completed by his son, and subsequently much altered. It consisted originally of eleven aisles, and the eight aisles which were afterwards added (976–1001) made it one of the largest buildings in Europe, but the effect of its great extent (420 feet by 375 feet) is marred by its height, which is only about 30 feet to the roof. Another notable specimen of Moorish architecture is the Giralda or cathedral-tower of Seville. It is supposed to have been built by Abú Yusúf Yakúb (A.D. 1171) as a tower of victory, and was used by the Moslems as a minaret or muezzin-tower. The base is a square of about 50 feet, from which the tower rises straight for 185 feet, and is now crowned by a belfry added in the sixteenth century. The lower part of this tower is nearly plain, but from about one-third of its height upwards it is enriched by sunk panels filled with ornamentation in relief, which give lightness and grace to the structure without affecting its general massiveness. The most characteristic Moorish palace in existence is the Alhambra in Granada, an immense structure of simple and rather forbidding exterior, but within gorgeous almost beyond description. (See *Alhambra.*) In this palace are found to perfection the distinctive characteristics of Moorish architecture.


The Giralda

Moors, a Mahommedan, Arabic-speaking race of mixed descent, forming part of the population of Barbary, and deriving their name from the Mauri, the ancient inhabitants of Mauritania, whose pure lineal descendants are, however, the Amazirgh, a branch of the Berbers. The modern Moors have sprung from a union of the ancient inhabitants of this region with their Arab conquerors, who appeared in the seventh century. As the Mahommedan conquerors of the Visigoths in Spain (711–713) came from North Africa, the name Moor was also applied to them by Spanish chroniclers, and in that connection is synonymous with *Arab* and *Saracen*. These Moors pushed northwards into France, and finally settled in Spain south of the Ebro and the Sierra Guadarrama. Here, for centuries, art, science, literature, and chivalry flourished amongst them, whilst the rest of Europe was still sunk in the gloom of the Dark Ages. Before the close of the thirteenth century their possessions were limited to the Kingdom of Granada, which was finally subdued by Ferdinand the Catholic in 1492. Great numbers of the Moors emigrated to Africa, but the remainder, under the name of *Moriscos*, assuming in great part a semblance of Christianity, submitted to the Spaniards. They were, however, expelled from Spain by Philip II and Philip III. Between 1492 and 1610 about 3,000,000 Moriscos are estimated to have left Spain. The expelled Moors, settling in the north of Africa, founded cities from which to harass the Spanish coasts, and finally developed into the piratical states of Barbary, whose depredations were a source of irritation to the civilized Christian powers even till well into the nineteenth century.—BIBLIOGRAPHY: S. Lane-Poole, *The Moors in Spain*; S. P. Scott, *History of the Moorish Empire in Europe*.


Moorish Decoration—Court of the Alhambra

Moquegua, a maritime province of Southern

Peru, traversed by the Andes. A considerable trade is carried on in wines, spirits, olives, and oil with Bolivia, via the adjacent department of Puno. Borax is produced, the deposits of Salinas being operated by a London company. Moquegua is the capital; Pacocha or Ilo is the southernmost port of Peru near the Ilo Valley, and is famous for olives. Area, 5549 sq. miles; pop. about 42,890.

Moquegua, a town and capital of the above province, is of great antiquity, and of reputed pre-Inca origin. It stands on the River Moquegua at an altitude of 1367 metres, and in a valley of the same name. A State-owned railway connects it with Pacocha (98 kilometres). Formerly Moquegua wines were renowned throughout Peru, but the rapid drying up of the river has reduced the wine-growing industry to poverty. Wines, spirits, and fruit are still traded. Pop. between 5000 and 6000.

Mora, a game known to the ancients, and still in vogue in the south of Europe. The two players simultaneously present each a hand, with some of the fingers extended, at the same moment endeavouring to guess the aggregate number of fingers so extended. An accurate guess counts one; five is game.

Moraceæ, a family of apetalous dicotyledons, sometimes united with Urticaceæ. It includes many important plants, such as the bread-fruit, fig, hemp, hop, mulberry, &c.

Moradabad, a town of India, in Rohilkhand, in the United Provinces, on the Ramganga. It is noted for its metal-work, and is a centre of local trade. Pop. 80,000.—The district has an area of 2281 sq. miles. Pop. 1,260,000.

Morales (mo-rä'läs), Luis de, a Spanish painter, surnamed *El Divino*, probably because he painted sacred subjects almost exclusively, was born at Badajoz in 1509, died there 1586. His *Mater Dolorosa*, at Madrid, is considered his masterpiece.

Morality Play. See *Drama*.

Morat (mo-rä; Ger. *Murten*), a town in the Swiss canton of Freiburg, on the Lake of Morat. Here, on the 22nd of June, 1476, the Swiss Confederacy met and defeated the forces of Charles the Bold, Duke of Burgundy, who was killed during the battle. Pop. about 2400.

Moratorium (Lat. *mora*, delay), a period during which the payment of debts cannot be enforced. A moratorium is generally declared by the Government of a state in times of great financial stress (as in France in 1870, and in Britain in 1914), when panic is feared and delay for the restoration of public confidence essential. Commercially, the term is applied to the extension of time given by a creditor to his debtor for payment of a bill of exchange.

Moravia (the Austro-Hungarian Mähren), a province of Czecho-Slovakia, formerly in the Austrian Empire; area, 8584 sq. miles. Brno or Brünn (q.v.) is the capital and the seat of the Supreme Court of Justice of Czecho-Slovakia. The minerals are of considerable importance, and include iron, coal, graphite, and slate. The chief agricultural crops are rye, oats, barley, potatoes, beetroot, and flax. Before the European War Moravia was the most important manufacturing province in Austria-Hungary. Its woollen industries are of world-wide fame, and linen and cotton, beet-sugar, iron and steel goods, machinery, beer (Pilsener), and spirits are also turned out in large quantities. In 1029 Moravia was united to the Kingdom of Bohemia, with which it passed to Austria in 1526, and became a part of Czecho-Slovakia (q.v.) on 28th Oct., 1918. Pop. 2,622,200.

Moravian Brethren, also called **United Brethren**, **Herrnhuter**, and officially **Unitas Fratrum** (Unity of Brethren), a Protestant sect or Church which originally sprang up in Bohemia after the death of John Huss. After the sanguinary religious wars which prevailed in Bohemia until 1627 they were everywhere almost annihilated. Their doctrines were still, however, secretly cherished in Moravia, and in 1722 a colony emigrated thence, and were invited by the Lutheran Count Zinzendorf to settle on his estate near Berthelsdorf, in Saxony, where they built the town of Herrnhut, still the headquarters of the Church. The doctrines of the brethren had hitherto been more in harmony with the Calvinistic than with the Lutheran form of Protestantism, but under the influence of Count Zinzendorf, who himself became a bishop, they attached themselves to the Lutheran Church. The Moravian Brethren have always distinguished themselves as missionaries, and maintain stations in North and Central America, South Africa, Australia, and Tibet. They are distinguished for the puritanical simplicity of their life and manners, and for their earnest, if somewhat narrow and austere piety. The practice of living in exclusive communities or villages still obtains in Germany. Moravian schools deservedly enjoy a high reputation even among those who are not members of the community. The Moravian Church is estimated to number over 100,000 adherents (1921).

Moray, or **Murray**, **James Stuart, Earl of**, half-brother of Mary Queen of Scots, natural son of James V of Scotland and Margaret Erskine, born about 1533, shot in 1570. In 1558 he joined the Lords of the Congregation, and was soon recognized as the head of the reformers' party. On Mary's return from France Moray became her favoured adviser, but her marriage with Darnley and subsequent events caused a breach between them which constantly widened. On the deposition of Mary he was appointed regent, defeated her forces at Langside on her escape from Lochleven (1568), and appeared as evidence against her at her trial in England. He consequently incurred the bitter hatred of the queen's party, but earned from the people the title of 'Good Regent'. He was shot in the streets of Linlithgow by Hamilton of Bothwellhaugh, who was actuated by private grievances.

Moray, an ancient division of the Kingdom of Scotland, corresponding approximately to the modern counties of Moray (Elgin), Nairn, Banff, and part of Inverness.

Moray Firth, an arm of the North Sea, on the north-east coast of Scotland, containing at its widest extent the area between Duncansby Head in Caithness and Kinnaird Head in Aberdeenshire, a distance of 78 miles; but in a restricted sense that portion which lies between Tarbat Ness and either Burghead or Lossiemouth, and which extends into the Cromarty and Beauly Firths.

Morayshire. See *Elgin*.

Morbihan (mor-bi-ăŋ), a north-western department of France, on the Bay of Biscay, forming part of pre-Revolutionary Brittany. The northern part is hilly, but the rest is low and level, especially along the coast, which is deeply indented and island studded. The Canal de Brest traverses the department, which has also a good river system. The fisheries, especially of sardines, are important; rye, wheat, and potatoes are grown under the worst possible natural soil conditions; mineral wealth is represented by iron and slate. The chief town is Vannes; others are Lorient, Quiberon, Ploërmel, and Pontivy. Area, 2738 sq. miles; pop. 546,047.

Mordvins, a race of people inhabiting European Russia, and belonging to the Bulgaric or Volgaic group of the Finnish family of peoples. They are found chiefly in the governments of Penza, Simbirsk, Saratov, Samara, Nishegorod, and Tambov. Their numbers are estimated at 1,000,000.

More, Hannah, popular writer on moral and religious subjects, born at Clifton, Bristol, about 1745, died there 1833. Her talents early made her acquainted with Johnson, Burke, Garrick, and other literary men, and her plays, *The Inflexible Captive*, *Percy*, and *Fatal Falsehood*, were fairly successful. After the production of the last in 1779 she devoted herself to the composition of works having a moral and religious tendency, the diffusion of tracts, and philanthropic labours. Her success was astonishing, the profits of her works during her lifetime exceeding £30,000. Her *Strictures on the Modern System of Female Education*, *Cœlebs in Search of a Wife*, *Practical Piety*, and *Moral Sketches* are among her best-known books.

More, Sir Thomas, a Chancellor of England, only son of Sir John More, a judge of the Court of King's Bench, born in London in 1480, beheaded 1535. A portion of his youth was spent in the family of Cardinal Morton, Archbishop of Canterbury, and Chancellor; and he was then sent to Oxford, and afterwards entered at Lincoln's Inn. He had already formed an intimate and lasting friendship with Erasmus. About 1502 he became a member of Parliament, and immediately made for himself a place in history by upholding the privileges of the House of Commons to treat all questions of supply as their own exclusive business. On the accession of Henry VIII he was made Under-Sheriff of London. In 1514 he was Envoy to the Low Countries, soon after was made a Privy Councillor, and in 1521 was knighted. He appears to have ere this time considerably enriched himself by practice, and with his wife, a daughter of a gentleman of Essex named Colt, he kept up a noble hospitality. In 1528 he became Speaker of the House of Commons, and in 1529 succeeded Wolsey in the chancellorship. When Henry began his attacks on the Papal supremacy, More at once took up the position which his conscience dictated as a supporter of the old system. Henry marked him out for vengeance as an opponent of his matrimonial views, and More endeavoured to shield himself by retiring from office. He was requested to take the oath to maintain the lawfulness of the marriage with Anne Boleyn. His refusal to do so led to his committal to the Tower, trial for misprision of treason, and execution. His chief work is the *Utopia* (in Latin), a philosophical romance describing an ideal commonwealth.—BIBLIOGRAPHY: W. H. Hutton, *Sir Thomas More*; Sir S. Lee, *Great Englishmen of the 16th Century*; T. E. Bridgett, *Life of Sir Thomas More*.

Möre, one of the eighteen *fylker* (counties) of Norway, with a long, fiord-indented coastline on the Atlantic. Aalesund, Kristiansund, and Molde are the chief towns. Fishing is the principal industry. Area, 5811 sq. miles; pop. (1920), about 171,740.

Moreau (mo-rō), Jean Victor, French general, born at Morlaix, in Bretagne, in 1763, died 1813. Bred to the law, he early displayed a predilection for the military profession, and in 1789 he joined the army of the north at the head of a battalion of volunteers. He so distinguished himself that he was named commander-in-chief of the army of the Rhine and Moselle in 1796, destined to threaten Vienna simultaneously with the invasion of Italy by Bonaparte. In 1799 he was in command of the army of Italy, and next year had the command of the armies of the Danube and the Rhine. Being found guilty of participation in the conspiracy of Pichegru and Cadoudal against Napoleon (1804), he had to go into exile, and purchased an estate in Pennsylvania, where he resided for some years. He was subsequently induced to aid in the direction of the allied armies against his own country, but was mortally wounded in the battle before Dresden in 1813, and died a few days later.

Morecambe, a municipal borough and watering-place of Lancashire, England, on Morecambe Bay; served by the London & North-Western and Midland Railways. It is situated near Heysham, a Midland Railway port, whence steamers sail for Belfast, Dublin, and Douglas (Isle of Man). Pop. (1921), 19,182.

Moreen′, a woollen, woollen and cotton, or all cotton fabric of a warp-rib character, made in imitation of moiré (that is, having a watered appearance). It is used for dresses, curtains, hangings, &c.

Mo′rel, a genus of edible Fungi, group Discomycetes (Morchella), applied specifically to *Morchella esculenta.* This is plentiful in some parts of Britain, and common in Germany. It is much used to flavour gravies, and is sometimes employed instead of the common mushroom to make ketchup.

More′lia, a city and capital of the state of Michoacáan, Mexico, 6400 feet above sea-level; served by a branch of the National Railway. There is a cathedral and the oldest college in Mexico (San Nicolas de Hidalgo College). Cheese, cigars, cottons, woollens, and *pulque* are manufactured. Morelia was founded as Valladolid in 1541, and became state capital in 1582. As the birth-place of General Morelos the town received its new designation (Morelia) in 1828. Pop. about 42,000.

Morelos, an inland state of Mexico, immediately south of the Federal district. In the north it is mountainous (Popocatepetl, 17,881 feet). The first sugar-cane plantations were established by Cortez in Morelos. Silver, copper, and zinc are worked. The capital is Guernavaca. Area, 1895 sq. miles; pop. about 183,000.

Moreton Bay Chestnut. See *Chestnut.*

Morgan, Sydney, Lady, authoress and brilliant society figure, born in 1783, died in 1859. Her father was an actor on the Dublin stage, named MacOwen or Owenson. She early attracted attention by her musical and other accomplishments. In 1797 she published a volume of poems, followed by a collection of Irish songs, and two novels entitled *St. Clair* and the *Novice of St. Dominick.* In 1806 appeared her *Wild Irish Girl,* a novel which passed through seven editions in two years. In 1811 she married Sir Charles Morgan, an eminent physician. Among her other writings are the novels of *O'Donnell, Florence Macarthy,* and *The O'Briens and the O'Flahertys*; the *Life and Times of Salvator Rosa*; *Woman and her Master*; and *Passages from my Autobiography.*

Morganat′ic Marriage, in some European countries, one in which it is stipulated that the wife (who is inferior in birth to the husband) and her children shall not enjoy the privileges of his rank nor inherit his possessions. It is a perfect marriage from the ecclesiastical point of view, and also from certain legal points of view. The morganatic marriage is not recognized in Great Britain.

Morgarten, a place in Switzerland, canton of Zug, where a small body of Swiss in 1315 totally defeated a large force of the Austrians.

Morhange, a town of France, department of Moselle (formerly Lorraine), which gives name to a battle of the European War. On 14th Aug., 1914, the French armies of Dubail and Castelnau advanced into Lorraine, the advance culminating on the Morhange-Sarrebourg line, which formed the first trench system of the war, complete with concrete gun-emplacements and barbed-wire entanglements, and thoroughly surveyed and ranged for artillery by the German staff. On 20th Aug. the French armies were driven back in confusion, but were saved from annihilation by the support of Foch's 20th Corps on the extreme right. A stand was made astride the Meurthe, and positions were eventually taken up at the Grand Couronné (23rd Aug.), when one of the most decisive battles of the war turned defeat into victory.

Morier, James, English novelist, born in 1780, died in 1849. In 1812 and in 1818 he published accounts of two *Journeys through Persia to Constantinople,* but he was best known by his *Adventures of Hajji Baba of Ispahan* (1824), *Adventures of Hajji Baba in England* (1828), *Zohrab the Hostage* (1832), and *Ayesha the Maid of Kars* (1834). See *Picaresque Novel.*

Morlancourt, a village of France, in the department of the Somme, taken by the Germans in March, 1918, during the thrust for Amiens. There was much sanguinary struggling around the village in May and August, and it was definitively recaptured on 8th Aug. It has been 'adopted' by Folkestone.

Morland, George, painter, the son of a painter, born in London 1763, died 1804. His work deals with rustic and homely life, and the best of it is now highly prized by connoisseurs. He had extraordinary popularity during his lifetime, and about 250 of his pictures are said to have been engraved. *The Interior of a Stable,* now in the National Gallery, is perhaps his masterpiece.

Morley, John, first Viscount Morley, author and politician, born at Blackburn, Lancashire, 24th Dec., 1838. He was educated at Cheltenham and at Lincoln College, Oxford; was called to the Bar in 1873; was for some time editor of the *Literary Gazette*, conducted the *Fortnightly Review* from 1867 to 1882, and edited the *Pall Mall Gazette* for three years (1880–3), and *Macmillan's Magazine* for two years (1883–5). He also edited the English Men of Letters Series, to which he contributed the volume on Burke. He was the author of *Critical Miscellanies*, *Voltaire*, *Rousseau*, *Walpole*, *Life of Gladstone*, and *Recollections*. He represented Newcastle from 1883 to 1895; and in 1896 became member for the Montrose burghs. Radical and Home Ruler, he was Chief Secretary for Ireland in 1886 and 1892–5, Indian Secretary from 1905 to 1910, Lord President of the Council from 1910 to 1914, and resigned from the Cabinet when Great Britain decided to enter the European War. One of the original holders of the Order of Merit (1902), he was made a peer in 1908. His *Collected Works* (in 15 vols.) appeared in 1920. He died in September 1923.

Morley, a municipal borough of Yorkshire (West Riding), England; served by the Great Northern and London & North-Western Railways. It is mentioned in *Domesday Book*. Pop. (1921), 23,953.

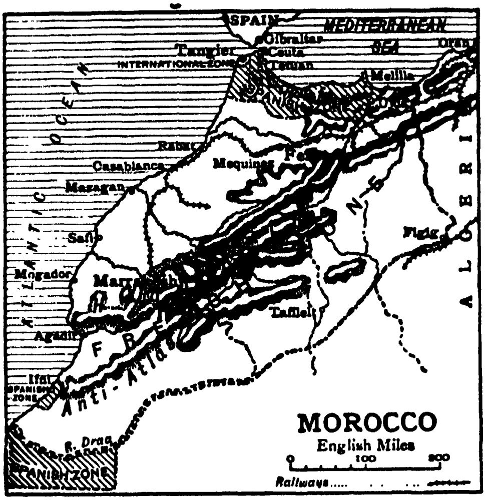
Mormons, a sect founded in 1830 by Joseph Smith, a native of the United States. The distinguishing peculiarities of the sect are—the belief in a continual divine revelation through the inspired medium of the prophet at the head of their Church, the belief in polygamy, and a complete hierarchical organization. The supreme power, spiritual and temporal, rests with the president or prophet (elected by the whole body of the Church), who alone works miracles and receives revelations. The Mormons accept both the Bible and the *Book of Mormon* as divine revelations, but hold them equally subject to the explanation and correction of the prophet. The latter-mentioned book (in large part a kind of historical romance written by one Solomon Spaulding in 1812) pretends to be a history of America from the first settlement of the continent after the destruction of the Tower of Babel up to the end of the fourth century of our era, at which time flourished the legendary prophet Mormon, its reputed author. It was said to have been written on gold plates, and concealed until its hiding-place was revealed to Smith by an angel. The name given to it was evidently owing to the important part which Spaulding had assigned to Mormon and his son Moroni in his novel; but Smith and his coadjutors, instead of confining themselves to the original manuscript, had clumsily engrafted upon it a number of maxims, prophecies, &c., evidently garbled from the sacred volume, and interpolated in such a manner as to involve anachronisms and contradictions. The doctrine of the Mormons is a mixture of materialism and millenarianism, and their most distinctive feature, polygamy, which, though originally condemned in the *Book of Mormon*, was introduced under a theory of 'spiritual wives', and a mysterious system of unrestricted marriage called 'sealing'. The Mormons first appeared at Manchester, New York, whence they were compelled by the persevering hostility of their neighbours to flee, first to Kirtland in Ohio (1831), then to Nauvoo, the 'City of Beauty', in Illinois (1838), and finally to the Salt Lake in Utah (1848). In 1844 the founder, Joseph Smith, was shot by a mob in Carthage prison, where his lawless behaviour had brought him. The advance made by Mormonism seems to have been due far more to the abilities of Brigham Young, the successor of Smith, than to the founder himself, who was little better than a dissipated and immoral scamp. Under Young's direction large tracts of land at Salt Lake were brought under cultivation, an emigration fund was established, and a skilful system of propagandism set on foot, by which large numbers of converts were brought from Europe, especially from Great Britain. A state was organized under the name of Deseret. Congress refused to recognize it, but erected Utah into a territory, and Brigham Young was appointed Governor of it. He was soon removed by the United States authorities, but after a time the Mormons were left pretty much to themselves. In 1870 Congress passed a Bill to compel them to renounce polygamy, or quit the United States. A prosecution was instituted against Brigham Young, who was sentenced to fine and imprisonment. In 1877 Young died, and was succeeded by John Taylor, an Englishman, who in turn was succeeded as president by Wilford Woodruff in 1887. In 1890 he proclaimed that polygamy was no longer taught as a doctrine of Mormonism. Woodruff was succeeded by Joseph Fielding Smith as president of the Church, and on the latter's death, in 1918, Heber J. Grant became president. Both Smith and Grant were polygamists. In 1922 Mormon emissaries were busy in London spreading their doctrine and enticing many young women to join the Mormon Church and to travel to Salt Lake. The Mormon Church numbers about 500,000 adherents.—Bibliography: W. A. Linn, *The Story of the Mormons*; E. W. Tullidge, *History of Salt Lake City*; B. H. Roberts, *Joseph Smith, the Prophet Teacher*; S. Martin, *The Mystery of Mormonism*; L. A. Wilson, *Outlines of Mormon Philosophy*.

Morning-glory, a name given to several climbing plants of the convolvulus family, having handsome purple or white, sometimes pink or pale-blue, funnel-shaped flowers.

Morny, Charles Auguste Louis Joseph, Comte

de, French politician, said to have been a half-brother of Louis Napoleon, born at Paris 1811, died 1865. He took a prominent part in the *coup d'état* of 1851, and was a prominent figure under the Second Empire.

Morocco, the extreme north-western country of Africa, bounded by Algeria, the Mediterranean, and the Atlantic. Physically Morocco is divided into two distinct climatic areas, that to the Atlantic side of the Atlas range and in the Mediterranean littoral being temperate, while the other, lying generally east and south-east of the mountains, is exposed to the scorching winds of the Sahara, and is rainless, riverless, and largely torrid. North Morocco is physically European in character, Africa proper beginning in actuality behind the Atlas Mountains, on the fringe of the Sahara. The northern ranges of the Atlas are a continuation of the Sierra Nevada of Spain, and were formerly continued across the strait between Sicily and Tunisia, and by the fold mountains of Sicily into the Apennines of Italy, the connection of the Atlas Mountains with the Alpine system of Europe having been broken by the formation of the Strait of Gibraltar and the subsidence of the land, of which Malta is one of the last fragments. The flora and fauna are typically European. The indigenous inhabitants of Morocco belong to the Caucasian branch of the human race, and are mainly Arabicized Berbers, being descended from a branch of the Indo-European family who inhabited North-West Africa in Roman times. A small proportion are of pure negro descent, but these are mainly the offspring of Sudanese slaves.



History.—In the eleventh century an African empire was founded by a religious enthusiast, which had for its capital Morocco, and which extended its dominion over Islamic Africa, excluding Egypt, and eventually overran Spain. During A.D. 1519–20 Morocco was seized by Sa'dian Shereef, and the state passed to the Shereefian family. The Shereefian umbrella is now hereditary in the family of the Filali Shereefs of Tafilet, and the Sultans belong to the dynasty of the Alides founded by Mulai-Ahmed, being, therefore, lineal descendants of Ali, uncle and son-in-law of Mahomet. The Sultan is called Emir-el-Mumenin or 'Prince of the Faithful' (True Believers), and was formerly both a spiritual and temporal despot; but although nominally an independent sovereignty, his empire is now divided politically into three zones (see map).

Language, &c.—The most important languages are French, Spanish, and Arabic; the prevailing religion is Sunnite Mahommedanism. Area of the Empire of Morocco, about 281,500 sq. miles; native pop. 6,000,000.

French Zone: Government.—The Sultan follows the advice of a French Resident-General who resides generally at Rabat. The Resident General is Minister of Foreign Affairs, and the French military commandant is Minister for War. The Sultan acknowledged the French Protectorate in April, 1912, when Maréchal Lyautey (q.v.) became Resident-General.

Currency, &c.—The nominal currency is the Moroccan franc with circulation limited to the French Zone (exchange nominally 25·225 francs = £1). Weights and measures are on the metric system.

Forests: cork-oak, cedar, Thuya, Argan, Zean oak, Aleppo pine, and Phœnician juniper; Montpellier maple, pear tree, white poplar, sumach, ash, gum acacia, and wild olive. Forestal area, 3,750,000 acres.

Agriculture: sugar-beet, cotton, vine, olive, cereals, cattle, horses, camels, and sheep.

Minerals: phosphates, iron, lead.

Exports: cereals, almonds, hemp and flax, palm-fibre, skins and hides, Moorish carpets and slippers (hand made), bees'-wax, cattle, sheep, and gums.

Imports: chiefly candles, hardware, leather goods, sugar; cement, lime, and gypsum; coal, iron, and steel.

Ports: Kenitra (350); Rabat (300); Fedalah (500); Casablanca, the chief port and commercial centre of the French Zone (1700); Mazagan (600); Safi (700); Mogador (200); Agadir. The bracketed figures indicate approximately the working capacity in tons per diem. *Other Towns*: Fez, Meknes, Marakesh, Azemmom, Taza, and Sefron. Fez, Tafilet, Marakesh, and Rabat are Shereefian capitals containing palaces of the Sultan. Pop. of French Zone (native) estimated at 5.500,000.

Spanish Zone: Government. — The Sultan chooses a Khalifa from two submitted by the Spanish Government, and the Khalifa governs under control of a Spanish High Commissioner with head-quarters at Tetuan. By the Treaty of Madrid (27th Nov., 1912) Spain was permitted by France to occupy a definite zone.

Currency, &c.—Spanish notes of 20 pesetas are in circulation. Moorish (Hassani) native silver and bronze coinage is current. Both metric and native systems of weights and measures are used.

Agriculture, Horticulture: vine, olive, orange, apple, cherry, walnut, chestnut, mulberry, and pomegranate; some wheat, barley, maize, and millet; cork, carob, and ilex trees.

Minerals: iron, silver, and lead.

Fish: sardines and tunny.

Exports: fish, iron ore, silver ore, skins, wool, esparto, and wickerware.

Imports: confectionery and biscuits, cereals, flour, fruits, groceries and provisions, rice, salt, sugar, vegetables; wines, spirits, and beer; cement, lime, and gypsum; coal, candles, cotton goods, chemicals, hardware, motor-cars, straw, toys, vehicles, wooden goods, and woollens.

Towns: Tetuan (administrative capital), Melilla, Ceuta, Arzila, Laraiche, Alcazar, Alhucemas, and Peñon de Velez.

Ifni, a maritime territory lying south of the French Zone, granted to Spain in perpetuity by the Sultan (Treaty of 26th April, 1860, Article 8). It originated in a fishing-station known as Santa Cruz de Mar Pequeña, founded by Spain in 1458, and now extends as an ‘ enclave ’ between the Rivers Bou Sedra (north) and Wad Nun (south) to a depth of 25 kilometres from the coast.

See *Marabouts*; *Tangier*; *Rio de Oro*; *Spain*; *France*; *Almoravides*.—BIBLIOGRAPHY: B. Georges-Gaulis, *La France au Maroc*; E. Wharton, *In Morocco*; A. Merry del Val, *The Spanish Zone in Morocco* (*Geographical Journal*, May–June, 1920).

Morocco, a fine kind of leather made from the skins of goats, imported from the Levant, Morocco, Spain, Belgium, &c., tanned with sumach, dyed, and grained, the last process being that which gives it its well-known wrinkled appearance. It is extensively used in the binding of books, upholstering furniture, making ladies' shoes, &c. Imitation moroccos are made from sheep-skins, so perfect in appearance that it is difficult to distinguish them, but they are entirely lacking in the durability of the real article. Imitation morocco is also made from compressed paper, as well as from cellulose by a process somewhat similar to that employed for making artificial silk fabrics.

Moron de la Frontera (ancient **Arumi**), a town of Seville, Spain, on the Guadaira, and connected with Seville by rail. It has remains of a Moorish castle erected on Roman foundations, and demolished by the French in 1812. Pop. about 18,000.

Moroxite, a greenish-blue variety of the mineral apatite.

Morpeth, a municipal borough of Northumberland, England, on the Wansbeek. It is served by the North-Eastern Railway, and is a railway junction. An abbey was founded at Newminster, near by, in the twelfth century; the church of St. Mary dates from the fourteenth century. There are some manufactures, and extensive collieries are located in the vicinity. Pop. (1921), 7580. Parliamentary borough, pop. 49,677.

Morpheus, in Greek mythology, the son of sleep, and god of dreams.

Mor'phia, or **Morphine**, the narcotic principle of opium, is a vegetable alkaloid of bitter taste, which was first isolated from opium, in which it exists in the form of two soluble salts, about 1807. Morphine itself is only soluble in water or ether, but dissolves readily in acids. Its salts, especially the hydrochloride, acetate, and sulphate, are widely used in medicine for the relief of pain. It is most commonly given by hypodermic injection, as by this means more accurate dosage and greater control over the administration are obtained. In small doses it is a powerful sedative, and ensures sleep even when pain of a severe character is present, while in large doses it is a narcotic poison. Great care has to be taken in regard to its continued use, as the morphia habit (morphomania) may be easily established, so that self-administration of the drug is always unwise. Larger and larger doses can be tolerated by continuous use, and the morphia habit is, among Western races, a serious danger. It occurs most frequently in people suffering from some painful chronic disease, and in over-wrought brain-workers.

Morphology, a branch of biology which deals with the structure and *form* of animals and plants, and their different organs, from those of the lowest to those of the highest type. It includes: (1) external morphology; (2) anatomy; (3) histology, or minute anatomy, of which cytology is a branch dealing with the cell. In morphology questions of *homology* and *analogy* (see *Analogue*) are frequently of the greatest importance, and comparative morphology may be said to lie at the foundation of all true systems of classification and arrangement.

Morris, Sir Lewis, English poet, born near Caermarthen in 1833, died in 1907. Educated at Oxford, where he graduated first class in classics in 1855, he was called to the Bar, and practised from 1861 to 1881. His poems have been widely popular. They include *Songs of Two Worlds*, *Epic of Hades*, *Gwen*, *Ode of Life*, *Songs Unsung*, *Songs of Britain*, &c. His Jubilee and Coronation poems were rewarded with medals. He was knighted in 1895.

Morris, William, poet, artist, designer, and Socialist, was born on the 24th March, 1834, and died 3rd Oct., 1896. He was educated at Marlborough, and at Exeter College, Oxford, where he read for a pass-degree. At Oxford he met Burne-Jones, whose friendship was an important factor in his life. He abandoned his original intention of going into the Church, and chose to follow the profession of painter. He was of independent means, having an income of £900 a year after he came of age. In 1857 he helped Rossetti to decorate the Oxford Union; the work was done too rapidly and too soon, and did not last. Morris married in 1859, and, desiring an ideal home, he commissioned his friend Philip Webb to build him a house (The Red House) at Upton, in Kent. The building and decoration of this house, the smallest detail of the furniture of which was specially designed, led to the foundation in 1861 of Morris, Marshall, Faulkner, & Co., a firm of decorators and manufacturers. Morris was the senior partner and the moving spirit, and he did more than anyone else to exorcise the spirit of drab ugliness from Victorian houses. In 1858 he published his *Defence of Guinevere*; his *Life and Death of Jason* appeared in 1867, and his *Earthly Paradise* from 1868–70. His poems, good in themselves, did much to widen the outlook of readers of poetry, showing them that there were other civilizations besides that of Victorian England. He became keenly interested in the art of illuminating manuscripts. He translated the *Æneid* (1875) and the *Odyssey* (1887), as well as a number of Icelandic sagas. His epic *Sigurd the Volsung* appeared in 1876. In 1883 Morris became an ardent Socialist, and managed and financed a Socialist paper, *Commonweal.* He was not altogether trusted by the Socialist party, and finally broke with the anarchistic wing of it. His interest in the movement gradually waned. In 1890 he started the Kelmscott Press at Hammersmith. It issued in all fifty-three books. The *Kelmscott Chaucer*, issued in 1896, is considered by many the finest printed book ever produced.

Morris was a man of the most forceful personality, and his interests and enthusiasms were manifold. He practised many arts, because according to his conception all art was one. He wished to go back to the Middle Ages, not because he was retrogressive, but because he thought civilization had taken the wrong turning, and that to regain the right path it was necessary to go back to where the ways had parted. His influence both on poetry and house decoration was profound and salutary.—BIBLIOGRAPHY: J. W. Mackail, *Life and Letters of William Morris*; A. Clutton Brock, *William Morris: his Work and Influence*; A. Vallance, *W. Morris: his Art, his Writings, and his Public Life.*

Morris-dance (that is, *Moorish-dance*), a dance supposed to have been derived from the Moriscos in Spain, formerly danced at puppet-shows, May-games, &c., in England. Bells were fastened to the feet of the performers, which jingled in time with the music, while the dancers clashed their staves or swords. In the reigns of Henry VII and VIII it was a principal feature in the popular festivals.

Morrison, Mt., or Niitaka-yama, a peak of Taiwan (Formosa), the highest in the Japanese Empire, and the culminating point of the Niitaka range to the south of the island. Altitude, about 14,000 feet.

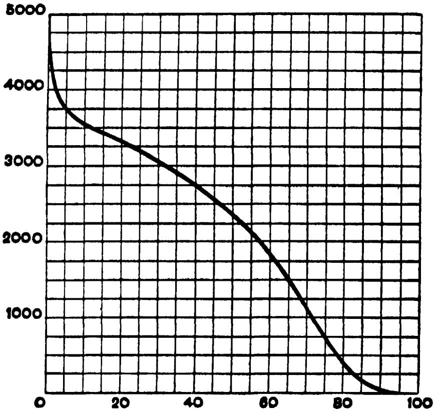
Morse, Samuel Finley Breese, inventor of the electric telegraph in its first practicable form, born at Charlestown, Mass., 1791, died at New York 1872. He was educated at Yale College, and in 1811 went to England to study painting under West. In 1813 he was awarded the gold medal of the Royal Academy for his model of the *Dying Hercules*. In 1829 he went to Europe for three years, and during the return voyage worked out roughly a plan for employing electromagnetism in telegraphy. It was not until 1835, however, that he was able to exhibit an instrument that was found to work well. By July, 1837, this instrument was perfected, and ultimately in 1843 Congress granted him means to construct an experimental line between Washington and Baltimore. From that time Morse's instrument came into general use in America and Europe. In 1857 the representatives of ten countries met at Paris, and voted him 400,000 francs.

Mortality, Law of. A type of question of great importance to insurance offices is: Of 100,000 men who reach their twentieth birthday, how many will survive till they are fifty? Numerical tables which enable answers to be given to questions of this kind are called *mortality tables*, and the rule or law which they embody, the *law of mortality.* At one time the only statistics available in England were abstracts of parish registers, called *bills of mortality*, and the earliest tables were based on very inadequate data. The *Northampton Table* was constructed by Richard Price in 1780 from certain records of baptisms in Northampton during the years from 1735 to 1780. In the *Carlisle Table* Joshua Milne adopted the correct method of tabulating the number of deaths occurring within each year of age, and comparing this number with the number of people alive at that age. The Institute of Actuaries in 1869 published tables based on the experience of twenty insurance companies; these tables are still largely used, though many companies work on statistics compiled from their own experience. Attempts have been made to find a mathematical formula embodying the empirical data of the tables. Demoivre, for instance, proposed the very simple law that out of every 86 children born alive 1 dies every year. This rule gives approximately correct results about middle life, but is far too crude for the purposes of the actuary. Formulæ of much greater value have been suggested by Gompertz and by Makeham; these are useful in calculations of annuities on joint lives.

The annexed table is condensed from the *English Life Table No. 3* (1864), one of a series of tables based on English census returns, and therefore representative of *average* lives. Insurance companies for the most part use tables applicable to *selected* lives; important examples are the HM (healthy males) and HF (healthy females) tables of the Institute of Actuaries.

Age.	Number Alive at each Age.	Number Dying in the following Year.
0	5117	837
1	4280	275
2	4005	142
3	3863	92
4	3771	67
5	3704	50
10	3530	20
15	3443	18
20	3336	28
25	3194	29
30	3045	31
35	2889	33
40	2721	35
45	2537	39
50	2332	44
55	2095	51
60	1824	59
65	1508	69
70	1144	77
75	758	75
80	411	58
85	169	33
90	48	13
95	8	3
100	1	—

The table, or the graph, supplies the means of answering some interesting questions. If we ask, for example, what chance a man entering upon age thirty has of surviving till he is sixty, we see from the table that, out of 3045 men of just thirty, 1824 reach sixty. The chance of a particular individual surviving is $\frac{1824}{3045}$, or about $\frac{3}{5}$; the chance of his not surviving is therefore $\frac{2}{5}$, so that, in the ordinary phraseology, the odds are 6 to 4 in favour of his being alive at sixty. Again, the table shows that 1508 live to sixty-five; sixty-five is therefore the age which it is an even chance that a man of thirty will reach. The *expectation of life* at a given age is an important number in calculations of life contingencies. It is the average number of years lived by a person after entering upon the given age, and may be found by calculating the total number of years lived by all the persons on the table after they enter upon that age, and dividing the sum by the number so entering. Take, e.g., the expectation of life of a man who has just reached thirty. Of 3045 who do so, 2889 live five years at least, 2721 other five years at least, and so on. Hence, neglecting small corrections, the total number of years lived by the 3045 men after thirty is found by adding the figures in the 'number alive' column from 2889 to the end, multiplying the sum by 5, and dividing the result by 3045. We thus find that the average number of years lived, i.e. the expectation of life at thirty, is thirty-one years nearly. It is easy to see that the exact value of this expectation may be obtained by finding the area under the graph between the age axis and the ordinate at age thirty, and dividing the area by this ordinate. The *rate of mortality* at a particular age is found roughly by dividing the number who die at that age by the number who enter upon it; the number who die at a particular age is got at once from the table by a simple subtraction. It will be seen that the graph has points of inflexion at ages thirteen and seventy-two. These features have an interesting interpretation. Thus, beginning with 5117 boys at age nothing, we see that 837 die before they are a year old, then fewer and fewer every year till at age thirteen only 17 die; afterwards the yearly mortality increases till age seventy-two, when 78 die; it then decreases steadily to the end.



To a company doing life-insurance and annuity business, life tables are of course indispensable. Exceptional risks may be undertaken at exceptional terms, but in ordinary business the proposal is treated as if it were concerned with an average life. A man of thirty, let us say, wishes to take out a whole-life policy. A company working on the above table considers what would happen if 3045 men insured at thirty. The table shows the number and the dates of the payments that would be made on both sides. The question is removed from the region of speculation, and becomes one for the exact calculations of the actuary. See *Annuities.*—Bibliography: *Textbook of the Institute of Actuaries* (vol. ii); *Journal of the Institute of Actuaries* (quarterly).

Mortar, a mixture of sand with slaked lime and water, used as a cement for uniting stones and bricks in walls. The proportions vary from 1½ parts of sand and 1 part of lime to 4 or 5 parts sand and 1 of lime. When exposed to the action of the air, this mixture absorbs carbon dioxide and 'sets', forming a hard, compact mass. *Hydraulic mortars*, which harden under water, and are used for piers, submerged walls, &c., are formed from so-called *hydraulic lime*, containing considerable portions of silica and alumina. See *Hydraulic Cement.*

Mortgage, in law, is a pledge of land, tenement, or other immovable property, as a security for debt, on condition that if the debt be not repaid in the time and manner specified in the transaction, the pledge shall be forfeited. Mortgages in England may be either legal or equitable. A legal mortgage must be in writing. It vests the legal estate in the mortgagee. An equitable mortgage may be constituted by a deposit of title-deeds. It in fact constitutes an acknowledgment of a grant of security for advances, and implies an engagement to execute a legal mortgage if required. Such a deposit will cover advances made subsequently to it. Joint-stock shares may also be mortgaged in this way. If the mortgager fail to redeem the mortgage, the mortgagee acquires by law the absolute title to the property. Equity, however, overrules this condition of the common law, and gives the mortgager a right of re-entry on his property on condition of subsequent payment of his debt or obligation with interest. This is called his *equity of redemption*. It may be exercised within twelve years of the mortgagee's entry on the estate or of his last-written acknowledgment of the mortgager's interest in it. The mortgager may be compelled to redeem his pledge, or forfeit his equity of redemption, by the process of *foreclosure*, but the equity courts give every indulgence to a mortgager before allowing the mortgage to be absolutely foreclosed, and will prolong the period several times if there is any prospect of the debtor being able to pay. Instead of foreclosing, the mortgagee may, in the event of the mortgager's default in payment after three months' notice or of two months' interest being due and unpaid, enter into possession of the mortgaged property and apply the rents in payment of the principal, interest, and management and other expenses; or he may sell the property and take repayment of the loan, interest, and costs, any balance being handed over to the mortgager and the latter remaining liable for any deficit. During the European War the Courts (Emergency Powers) Acts and the Rent and Mortgage Interest Restriction Acts imposed restrictions on the rights of mortgagees to enter into possession, sell, or foreclose, or to increase the rate of interest. In Scotland a mortgage is called a *heritable bond.*

Mortification, in medicine, is the death of a part of the body, while the rest continues to live. Mortification is a popular term, and when the process is confined to the soft parts of the body, the term sloughing is used; on the other hand, when a tangible portion of bone dies, the necrosed mass is called a sequestrum; while the term gangrene is more especially applied to the process when both hard and soft tissues of a limb are affected. Death of the tissues may follow any process which damages the vitality of the part, such as exposure to extreme cold, interference with the circulation of the blood, or inflammation due to some infection.

Mortification, in Scots law, a term applied to lands set apart, or to the setting apart of the lands, for charitable or public uses. *Mortmain* is a similar English term.

Mortmain (Fr. *mort*, dead, *main*, hand), in law, possession of lands or tenements in dead hands, or hands that cannot alienate, as those of a corporation. *Alienation in mortmain* is an alienation of lands or tenements to any corporation, sole or aggregate, ecclesiastical or temporal, particularly to religious houses. Such conveyances were forbidden by Magna Charta, and have been restrained and interdicted by subsequent statutes. By 7 and 8 Wm. III xxxvii, and 51 & 52 Vict. xlii (1888) a licence from the Crown dispenses from the statutes of mortmain, but in many cases a special charter or statute renders such licence unnecessary.

Mosaic consists of small pieces of coloured glass, marble, stone, or similar material fitted together to form a pattern or picture, and is frequently employed to decorate walls, vaulted ceilings, pavements, or architectural details. In classic times its use for these purposes was widespread, especially in dwelling-houses. The Romans distinguished several varieties: *opus tessellatum*, cubes of marble for pavements; *opus vermiculatum*, coloured marble for pictorial purposes; *opus musivum*, glass or enamel for wall decoration; and *opus sectile*, marble marquetry for walls and pavements. Common motives in design were the human figure, animals, fish, or geometrical patterns. Examples from Pompeii and Rome are in the British Museum; and fine Roman pavements can be seen at York, Cirencester, Dorchester, and other Roman settlements in England. In the earlier Middle Ages mosaic played an important part in church decoration. The artists of the Byzantine Empire especially developed its use, and mainly under their influence important schools developed in Spain and Italy. The finest work was produced from the fourth to the eighth centuries A.D., and after a period in which quality declined a revival took place, especially in Italy. This lasted until the fourteenth century, when it was almost entirely replaced by fresco. Small glass cubes were the material almost invariably employed, decoration being applied to the apse, the spaces between arches, and sometimes to the whole interior wall surface, as at St. Mark's, Venice, and the Capella Palatina at Palermo. The effect of the rich colour, modified by the comparatively dim light of the Byzantine or Basilican churches, is one of great splendour. In the earliest examples the background is blue; but this was soon superseded by gold, which was also freely used in other parts of the mosaic, such as the drapery. In the figures there is no attempt at naturalism, formalized and hieratic types being used which usually have singular dignity and decorative quality. Classic influence is strong both in the subject and treatment of the earlier mosaics; for example, *The Good Shepherd* (Christ within a circle of sheep) is an adaptation of the pagan *Orpheus charming the Beasts*. Later, the most frequent subjects are a *Majesty*, an immense figure of Christ surrounded by saints, Christ as a lamb with the Apostles as sheep, the Virgin and Saints, and the Last Judgment. Among the best existing mosaics are those of Ravenna (fifth to seventh centuries); St. Mark's, Venice (eleventh to thirteenth centuries); St. Sophia, Constantinople (sixth, ninth, and eleventh centuries), and of Salonika (fifth to eleventh centuries). In modern times mosaic has rarely been employed with success. Examples of its use are the interior of the dome of St. Paul's Cathedral, and the side chapels of Westminster Cathedral. An important application of mosaic to the decoration of pulpits, tombs, and architectural details was made in Italy by the Cosmati family and others during the thirteenth century. Examples can be seen in Westminster Abbey in the tomb of Henry III and the shrine of the Confessor.—BIBLIOGRAPHY: Dalton, *Byzantine Art*; Ruhter, *Golden Age of Christian Art*.

Mosaic Gold, an alloy of copper and zinc, called also *ormolu*; also a sulphide of tin, the *aurum musivum* of the ancients.

Mosasaurus, a gigantic extinct marine reptile occurring in the calcareous freestone which forms the most recent deposit of the Cretaceous formation in Northern Europe. It was about 25 feet long. Various allied genera are now known, from Kansas and elsewhere, and are styled collectively mosasaurs.

Moscheles (mŏ′she-les), Ignaz, a pianist and composer, born at Prague 1794, and died in 1870. He toured successfully in Germany, and caused a great sensation in Paris and London. He then settled in London, and became professor of music at the Royal Academy in 1825. Mendelssohn in Berlin and Thalberg in London were among his pupils, and at Mendelssohn's request Moscheles gave up his London professorship and took a similar post at Leipzig in 1848.

Moschus, a Greek pastoral poet, a native of Syracuse. The time when he flourished is not accurately known, some making him a pupil of Bion, who is supposed to have lived under Ptolemy Philadelphus (third century B.C.), while others suppose him a contemporary of Ptolemy Philomētor (160 B.C.). Four idylls form the whole of the remains of Moschus, of which the most beautiful is the fine lament for Bion.

Moscow, a government of Central Russia, between the governments of Tver (north) and Kaluga (south), drained by the Volga (which traverses the northern boundary), Oka, Moskva, and Sestra. Moscow (*Moskva*) is the capital. About 39 per cent of the entire area is afforested, and, although the district is largely unsuitable for agriculture, oats, rye, barley, potatoes, and some flax are produced. It is best known as the great entrepôt of trade and the most densely inhabited area in pre-Revolutionary Russia. Area, 12,847 sq. miles (subdivided into thirteen districts); pop. (1915), 3,662,900 (or a density of 285 per sq. mile).

Moscow, the ancient capital of Imperial Russia, and since 1918 the seat of the Soviet Government. It stands on the Moskva (which is the Russian for Moscow), a tributary of the Oka, and, like Rome, it is built upon seven hills. The pre-eminent feature of Moscow is the *Kreml*, or Kremlin, an ancient fort surrounded by embattlemented walls 40 feet in height, triangular in shape, and enclosing an area of from 80 to 100 acres. It has five gates and nineteen towers, and contains the Cathedral of the Assumption (Uspenskiy Cathedral; 1474–9), in the Lombardo-Byzantine style, where Tsars were crowned and their accession proclaimed by the ringing of Ivan Veliky (Big John), a gigantic bell in an isolated cross-surmounted campanile, 318 feet high, erected by Boris Godunov in 1600. Beneath the tower stands on a pedestal the Tsar Kolokol (King of Bells), 65 feet in circumference (rim), 19 feet high, and nearly 200 tons in weight—the largest bell in the world. It was cast in 1735, and cracked in the foundry during the fire of 1737 without having sounded a note. There are over 400 churches in Moscow, which has been the see of the Metropolitan (formerly Patriarch) of Central Russia since 1825. The cathedral of St. Basil, with twelve variegated domes, was founded by Ivan the Terrible in 1554 to commemorate the conquest of Kazan;

in the cathedral of the Archangel Michael (1508) are the tombs of Peter II and Ivan the Terrible; in fact, all the Tsars from Ivan Kalita (1340) to Ivan Alexivitsh (1696). Moscow has been since the early fourteenth century an important commercial city, and in immediately pre-Revolutionary times it was the hub of the railway and inland-transport systems of European Russia, and had an enormous transit trade in hemp, oils, cereals, food-stuffs, textiles, paper, tobacco, and chemicals. There was also a considerable manufacturing industry in sugar-refining, &c. Pop. nominally about 1,000,000.

Moscow is first mentioned in history in 1147. It was a dependency of the Princes of Vladimir during the Mongol conquests of 1237 and 1293. In 1325 the Metropolitan Peter established himself at Moscow, and the city became the centre of Russian life. From *Moskva* comes the name *Muscovy*, " a name which historically describes the growth of the second Russian power ". Moscow was to Russia what Paris was to France; it was from Moscow as the nucleus that the germ of Russian power found its early expansion. In 1367 the Kremlin was walled; Moscow was sacked by the Mongols in 1382, and on the accession of Ivan III (1462–1505), Prince of Moscow, he proclaimed himself Tsar of All Russia. The Tartars burned the city in 1571, when 170,000 people are reputed to have perished in the flames. Peter the Great, desirous of building up a great military empire, mistrusted by the people and face to face with innumerable conspiracies, retired from Moscow in 1703 and founded St. Petersburg (Petrograd). In 1812, a week after the battle of Borodino, French troops entered the Kremlin, and the Russian army retired. By an accident the city was set on fire; the inhabitants fled, and the French and Russian soldiers looted the commercial and wealthy quarters. However, the peasants rose in revolt, and Napoleon was forced to evacuate (19th Oct., 1812) after unsuccessful attempts to blow up the Kremlin. The city was rebuilt in 1813. During the Revolution of 1905 the streets of Moscow were drenched in blood. Kerensky's short-lived régime terminated in the city in Aug., 1917, and Moscow became the Soviet capital on 14th March, 1918.

Moseley, Henry Gwyn Jeffreys, English physicist, killed in action in Gallipoli on 10th Aug., 1915, at the age of twenty-seven. His premature death was widely deplored as an irreparable loss to science. His great discovery of the relationship between X-ray spectra (q.v.) and atomic number (see *Matter*; *Number, Atomic*) threw a flood of light on the organization of the under-world of electrons, atoms, and molecules. An account of his life and work is given by Sir Ernest Rutherford in *Nature*, 9th Sept., 1915.

Moselle, a frontier department of North-Eastern France, formed by the district of Lorraine, ceded by Germany under the Peace Treaty of 28th June, 1919. Area, 2408 sq. miles; pop. 655,211.

The districts of Lower Alsace and Upper Alsace form the departments of Bas-Rhin (area 1848 sq. miles; pop. 701,000) and Haut-Rhin (area 1354 sq. miles; pop. 518,000) respectively. The total area added to France is 5605 sq. miles, with a pop. (1910), 1,874,014.

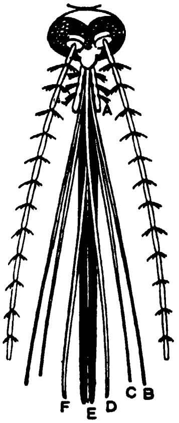
Moses, leader, prophet, and legislator of the Israelites, the son of Amram and Jochebed, was born in Egypt about 1600 B.C., during the time of the oppression of the Hebrews. His mother placed him in a basket of bulrushes on the river border, where he was found by the daughter of the Egyptian king as she went to bathe. She adopted him as her son, and in all probability had him educated for the duties of the priesthood. His expedition into Ethiopia, in his fortieth year, as leader of the Egyptians, when he subdued the city of Saba (Meroe), won the affections of the conquered Princess Tharbis, and married her, rests only on the tradition preserved by Josephus. An outrage committed by an Egyptian on a Hebrew excited his anger, and he secretly slew the Egyptian. The deed became known, and he escaped the vengeance of the king only by a hasty flight into Arabia. Here he took refuge with Jethro, a Midianitish prince and a priest, and espoused his daughter Zipporah. The promises of God that his race would become a great nation occupied much of his thoughts, and at last God appointed him the chosen deliverer from the bondage in Egypt. Being slow of speech, and possessing none of the arts of an orator, God therefore gave him power to prove his mission by miracles, and joined to him his elder brother Aaron, a man of little energy, but of considerable eloquence. Thus prepared, Moses returned to Egypt at the age of eighty years to undertake the work. At first he had the greatest obstacles to overcome, but after the visitation of ten destructive plagues upon the land, Pharaoh suffered the Hebrews to depart. Moses conveyed them safely through the Red Sea, in which Pharaoh, who pursued them, was drowned with his army. At Mount Sinai he received the Ten Commandments and the laws for the regulation of the lives of the Israelites. When they were already near the end of their journey towards Canaan, Moses saw himself compelled, in consequence of new evidences of discontent, to lead them back into the desert, for forty years more of toilsome wandering. He was not himself permitted, however, to see the Israelites settled in their new country on account of a murmur which, in the midst of his distresses, he allowed to escape against his God. After appointing Joshua to be the leader of the Hebrews he ascended a mountain beyond

Jordan, from which he surveyed the land of promise, and so ended his life in his 120th year. All superstitious reverence for his bones or his place of sepulture was prevented by the secrecy of his burial, and its effectual concealment from the people.—Bibliography: H. L. Taylor, *The Story of Moses*; T. K. Cheyne, *Encyclopædia Biblica*; S. R. Driver, *Authority and Archæology*.

Mosque, a Mahommedan church or house of prayer. These buildings are constructed in the Saracenic style of architecture, and often astonish by their extent and the grandeur and height of their cupolas or domes. In these Mahommedan places of worship there are neither altars, paintings, nor images, but a great quantity of lamps of various kinds, arabesques which form the principal interior ornament, and extracts from the *Koran* adorning the walls. Every mosque has its minaret or minarets. The buildings are often quadrangular in plan, with an open interior court, where are fountains for ablutions. The floor is generally covered with carpets, but there are no seats. Facing in the direction of Mecca is the *mihrab*, a recess in the wall to direct the worshippers where to turn their eyes in prayer, and near this is the *mimbar* or pulpit. The buildings may embrace accommodation for educational purposes, &c., besides the temple proper.

The Blue Mosque, Cairo

Mosquito (mos-kē'to), a term synonymous with gnat, and more particularly applied to those species of the gnat family (Culicidæ) whose blood-sucking habits render them a serious pest, especially in the tropical and Arctic regions. The female possesses a proboscis made up of the piercing and sucking mouth-parts. The eggs are laid in stagnant water, and hatch out into wriggling worm-like larvæ that ultimately pass into a resting or pupal stage, from which the adult emerges. The malarial diseases (including yellow fever) which seriously interfere with colonization in tropical regions are caused by microscopic animal blood parasites which spend part of their lives in the bodies of mosquitoes, and are introduced by their bites into human beings. These disease-carriers are, except in the case of yellow fever, species of Anopheles, distinguished by their bodies being disposed in a straight line when in the resting position, and usually by their spotted wings. The yellow-fever mosquito (*Stegomyia fasciata*) is marked with transverse black and white bands, and there is a characteristic lyre-shaped white mark on the thorax. Adult mosquitoes are destroyed by means of various sprays, containing formalin and other substances; are kept from sleepers by mosquito curtains; and repelled by smearing exposed parts of the skin with preparations containing essential oils. But the only really effective measures are those directed to abolition of breeding-places by thorough drainage, and the destruction of larvæ. For the latter purpose small fishes ('millions') can be introduced into the stagnant water where they live; various larvicides are employed; or the surface of the water is oiled with petroleum. See *Culicidæ*; *Gnat*; *Malaria*.

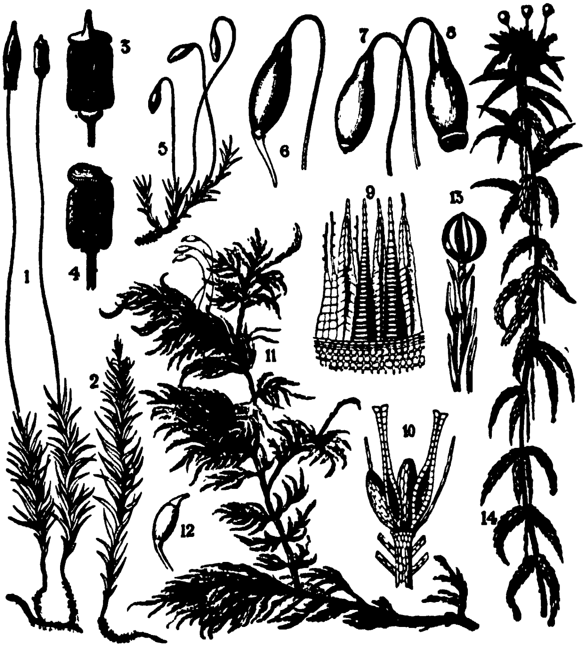


Head of Mosquito showing mouth parts. Much enlarged

A, Maxillary palp. B, Maxilla. C, Mandible. D, Labrum. E, Labium, F, Tongue.

Mosquito Territory, or **Bluefields**, a maritime division of Nicaragua, on the Caribbean, along which it extends for 225 miles; average width inland, 40 miles. The Misskito Indians, Zambos, and Jamaica negroes form the bulk of the population. Bluefields (pop. 1920, 4706) is the seaport-capital. Bananas are exported. The Mosquito Reserve was discovered by Columbus (1502), passed to Spain, and from 1655 to 1850 was a British Protectorate. In 1860 (Treaty of Managua) the territory was ceded to Nicaragua, and was formally incorporated in the Republic (as Zelaya) on 24th Nov., 1894.

Moss-agate, also called **Mocha-stone**, agate including brownish or greenish dendritic forms of some other mineral, which are often taken for traces of vegetation.



Mosses

1, *Polytrichum commune*; the spore-capsule to the left is concealed by the cap (calyptra), that to the right is exposed. 2, The same moss in an earlier stage of development. 3, Spore-capsule of *Polytrichum commune* with its lid. 4, The same after the falling away of the lid. 5, *Bryum cæspiticium*. 6, Spore-capsule of same with its calyptra. 7, The same after removal of the calyptra. 8, The same after removal of the lid, showing the teeth (peristome). 9, A portion of the peristome, enlarged. 10, Antheridia, archegonia, and paraphyses of *Bryum cæspiticium*. 11, *Hylocomium splendens*. 12, Spore-capsule of same. 13, *Andreæa rupestis* with burst spore-capsule 14, *Sphagnum cymbifolium* with spore-capsules still intact. 1, 2, 5, 11, 14, reduced; 3, 4, 6, 7, 8, 12, 13 × 3½; 9, 10 × 71.

Mosses, or **Musci**, one of the two main subdivisions of the Bryophyta. They are all small plants found chiefly in cool, moist situations, usually grouped together in cushions or mats. They have leafy shoots, but no genuine roots, the place of these organs being taken by thread-like rhizoids which are produced in great profusion. The internal structure of Mosses is simple, though rudimentary conducting tissues may be present, especially in the larger forms, such as Polytrichum. Vegetative propagation takes place abundantly from any detached portions, or by means of special buds (*gemmæ*). The sexual organs are *antheridia* and *archegonia*, similar in principle to the corresponding structures in ferns though somewhat larger. The fertilized egg-cell (zygote) develops into a stalked capsule or *sporogonium*, differing from that of Liverworts mainly in the mode of dehiscence, which is typically by means of an apical pore, fringed by a single or double set of teeth forming the *peristome*; this is a hygroscopic structure, which closes over the pore in damp air, but allows the spores to escape freely during dry weather. The presence of a *calyptra* (q.v.) is another difference from Liverworts. The spore develops into a branched, filamentous, alga-like thallus, the *protonema*, from which one or more leafy moss-plants arise later as lateral outgrowths. The classification of Mosses is difficult, depending mainly on minute characters of the peristome and the detailed structure of the leaves.

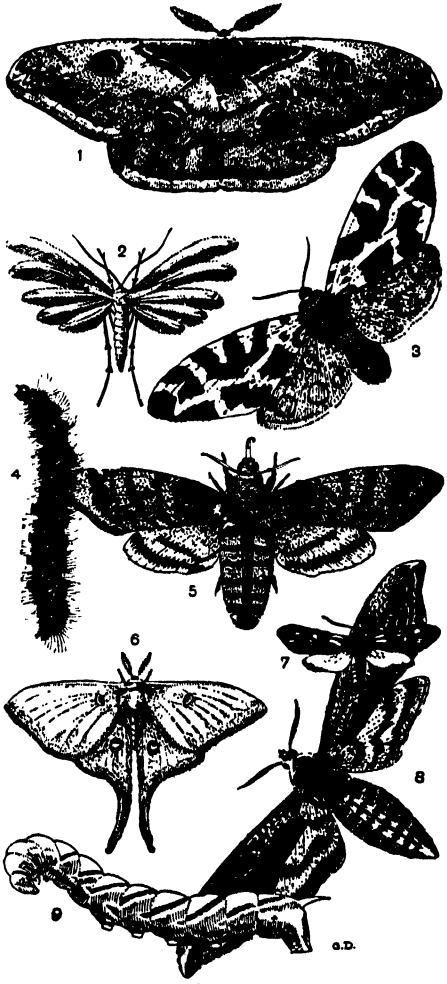
Mossley, a municipal borough of Lancashire, England, on the Tame; served by the London & North-Western Railway and by Huddersfield Canal. There are cotton, woollen, and engineering manufactures. Pop. (1921), 12,705.

Mostaganem, a seaport of Algeria (33° 55′ N. lat., 0° 10′ E. long.). It is connected with Oran direct by rail via Arzeu. There is a large trade, but the port is exposed. Alfalfa is the principal export; flour-milling and tanning are progressive; earthenware is manufactured. Mostaganem is the *Portus Magnus* of the Romans. Pop. 21,000.

Mosul′, a city of Mesopotamia, on the Tigris, opposite the remains of the ancient Nineveh. Besides numerous mosques there are churches of the Nestorians, Jacobites, and other Christians. It has a transit trade between Bagdad, Syria, Kurdistan, and Constantinople. The principal manufactures are cotton-stuffs. It was formerly celebrated also for its muslins, the name being derived from the town. Mosul was occupied by a British force on 3rd Nov., 1918. Pop. about 80,000.

Motet′, in music, a name applied to two different forms of composition: (1) a sacred cantata, consisting of a number of unconnected movements, as solos, duets, trios, quartettes, choruses, fugues, &c. (2) A choral composition, usually of a sacred character, beginning with an introductory song, followed by several fugal subjects, the whole ending with the exposition of the last subject, a repetition of the introduction, or a special final subject.

Moth, the popular name of a numerous and beautiful division of lepidopterous insects, readily distinguished from butterflies by their antennæ either being plumose or tapering to a point instead of terminating in a knob, by their wings being horizontal when resting, and by their being seldom seen on the wing except in the evening or at night (though some moths fly by day); hence the terms crepuscular and nocturnal lepidoptera applied to them. Amongst the more notable of the moths are the 'feather' or 'plume-moths', the death's-head moth, the 'clothes-moths', and the 'silk-moth' (*Bombyx mori*).



Moths

1, Great Peacock (*Saturnia pyri*), half natural size. 2, Plume (*Pterophorus pentadactylus*), natural size. 3, Tiger-moth (*Chelonia caja*), natural size. 4, Larva 5, Death's Head (*Acherontia atropos*), half natural size. 6, Luna (*Actias luna*), quarter natural size. 7, Six-spotted Burnet (*Zygæna filipendula*), two-thirds natural size. 8, Privet Hawk moth (*Sphinx ligustri*), three-quarter natural size. 9, Larva.

Mother-of-pearl, or **Nacre,** the hard, silvery, brilliant internal or nacreous layer of several kinds of shells, particularly of the oyster family, often variegated with changing purple and azure colours. It is destitute of colouring-matter, but is composed of a series of minute and slightly imbricated layers or ridges, the rays reflected from which interfere with each other and produce beautiful iridescent hues. The large oysters of the tropical seas alone secrete this coat of sufficient thickness to render their shells available for the purposes of manufacture. Mother-of-pearl is extensively used in the arts, particularly in inlaid work, and in the manufacture of handles for knives, buttons, toys, &c.

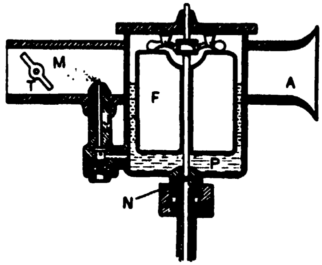
Motherwell, a town of Lanarkshire, Scotland, touching the Clyde on the south-west, and 13 miles from Glasgow by the Caledonian Railway. It lies in the middle of extensive coal-fields, and has a large iron and steel industry, and engineering works. Motherwell was united with Wishaw in 1920 to form a police burgh. Pop. (1921), 68,869.

Motherwort (*Leonŭrus cardiăca*), a labiate plant, 3 feet high, flowers in crowded whorls, white with a reddish tinge, found in some parts of England and North America.

Motley, John Lothrop, American historian and diplomatist, born in Massachusetts 1814, died 1877. He published his *History of the Rise of the Dutch Republic* in 1856 (3 vols.), a work which was further developed in the *History of the United Netherlands* (4 vols., 1860–8). Both works were received with the utmost favour, because they combined capacity for historical research with much power of pictorial representation. A work on a kindred subject was the *Life and Death of John of Barneveld* (1874). He was Ambassador from the United States to Vienna from 1861 to 1867, and to London from 1869 to 1870.

Mot-mot (Momotus, &c.), the name given to beautiful American birds related to rollers and kingfishers, and ranging from South Mexico and the West Indies to Paraguay. They are about the size of a jay, with a long tail, the two middle feathers of which are destitute of vanes. The name suggests the character of their note.

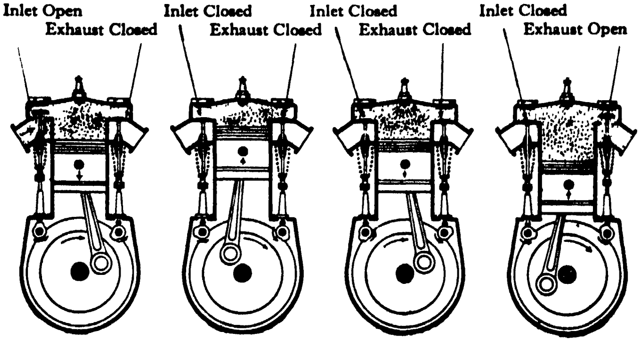
Motor-car Engine. It is customary to regard the motor-car as a modern invention, but in the eighteenth century Symington and Murdock constructed working models of steam-driven carriages for road locomotion. James Watt looked on Murdock's endeavours as a pure



Section of Carburettor

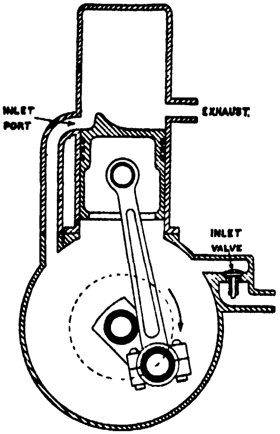
F, Float. A, Air inlet. P, Petrol. J, Jet. T, Throttle. N, Needle valve. M, Mixture to cylinder.

waste of time, and with his partner Boulton endeavoured to turn the young investigator from his folly. Although road locomotion was generally regarded as too great a flight of fancy in those days, other engineers, notably Trevithick, continued their investigations, and about the time that the first passenger train service was started, an English engineer, Walter Hancock, built a steam-driven car which ran for hire between Stratford and London. Gottlieb Daimler was the pioneer of the motor-car engine as known to-day. In 1886 he constructed a twin-cylinder engine which was used to drive a launch. Demonstrations of this boat were made on the Seine at the Paris Exhibition of 1887. The next year Daimler sold his patent rights, which were ultimately acquired by M. Levassor, a French engineer, who, in association with his partner M. Panhard, devised the motor-car transmission gear which is used to this day. Experiments have been made with many fuels: benzol, alcohol, acetylene, coal-gas, and producer gas, but the great majority of engines still use petrol. The motor-car engine is a type of internal-combustion engine (q.v.), and derives its power from an explosive mixture of petrol-vapour and air. The engine cylinder is provided with two valves, one to admit and the other to exhaust the gases. Before the petrol enters the engine it is passed through a carburettor, where it is completely converted into gas. A simple type of carburettor is shown in the illustration. The petrol falls from the tank through a pipe to the float chamber. As the float, usually an air-tight copper vessel, rises, the needle-valve passing through the central sleeve is forced to its seat and prevents further petrol entering. The float is of sufficient weight to allow the petrol level to be high enough to maintain a small drop or 'bead' of petrol on the top of the jet. This drop of petrol evaporates, and the gas is taken along with the air passing to the engine cylinder. Whenever the petrol level in the float chamber falls, the needle-valve opens and more petrol flows in. The level necessary to maintain efficient vaporization is thus maintained continuously. The throttle-valve controls the passage of the explosive mixture to the engine inlet-valve. The engine usually works on the four-stroke cycle. The four sectional views of the engine cylinder show the various actions in the cycle. The inlet-valve opens just as the piston begins to move downward in the cylinder, and the space left behind the moving piston is filled by the indrawn petrol-vapour and air. The second stage is the compression of this explosive mixture into small bulk before exploding it. The use of compression increases the efficiency of the engine. In the third stroke, that is, the second downward one, the mixture is exploded by an electric spark at the plug. The pressure in the cylinder rises abruptly, and then, as the piston moves in its stroke, the burnt gases fill the continuously increasing volume, and their pressure decreases. When the fourth stroke starts, the exhaust-valve opens, and the moving piston sweeps the residue out of the cylinder. The cycle of operations then recommences. Each cycle takes two revolutions for its complete performance. Only during the third stroke is there any useful energy transformation; the other strokes are required to prepare the gas and air for power-producing combustion, and to drive away the spent gas. In motor-cycles,



Inlet stroke Compression stroke Working stroke Exhaust stroke

Diagrams showing the Working of an Internal-combustion Engine engines working on this cycle are most common, but a large number, especially of the light-weight type, have two-stroke engines, in which case the piston acts as a valve by uncovering ports in the cylinder. The mixture of petrol-vapour and air is compressed slightly in the crank chamber, and enters the cylinder under this small pressure, sweeping the burnt gases out. The gas is compressed in the first stroke, exploded, expanded, and exhausted during the second stroke, the last operation only occupying a small fraction of the stroke. The pistons of these engines have a projection on the top to direct the gases when both ports are partly open. These two-stroke motor-cycle engines are very simple and cheap to manufacture, but are not so economical in the use of petrol as the four-stroke type, and the cylinders need decarbonizing more frequently. The ordinary mushroom-shaped valves of the motor-engine are sometimes replaced by two concentric sleeves moving relative to each other and to the cylinder, as in the Knight valve used in Daimler engines; or by a single sleeve with a rocking as well as an up-and-down motion, as in the Burt-M'Cullum system used in Argyll motor-car engines, Barr & Stroud motor-cycle engines, and Kelvin motor-boat engines. This type of valve is stated to be more silent in action than the mushroom form, and to give a greater and quicker opening.—Bibliography: *The Motor Manual* (The Temple Press); F. Strickland, *A Manual of Petrol Motors and Motor Cars*; A. W. Judge, *Automobile and Air-craft Engines*; F. J. Kean, *The Petrol Engine*.



Diagrammatic Section of Two-stroke Engine

Motor Vehicle. The early history of motor vehicles is the story of a war against engineering difficulties, prohibitive tolls, and oppressive legislation. Before the Locomotives on Highways Act was passed in 1861 the steam-coaches had a considerable measure of freedom in regard to speed, and averages of 10 miles per hour were maintained by the few cars in use. This enactment specified that three persons must be employed to drive a road locomotive, that a man carrying a red flag must precede the vehicle, and that the maximum speed must not exceed 4 miles an hour. These restrictions were modified, but only to a small extent, by the 1878 Act. An appeal case in 1881 established that these laws applied to all engine- or motor-propelled vehicles, no matter how light. The first internal-combustion engine-driven vehicle in Britain was Butler's tricycle (1885).

In the early 'nineties the few motor-cars crawled through London, preceded by red-flag bearers, causing considerable amusement. This continued until public opinion was roused to demand the repeal of these repressive laws, and in 1896 an Act was passed which liberated motorists from most of their restrictions. In 1903 the speed limit was fixed at 20 miles an hour, with lower values where the conditions were peculiar. Although speeds are usually in excess of the legal standard, there are few prosecutions nowadays unless the speed is so high as to cause danger to the public.

In the Panhard-Levassor transmission system the engine was mounted, as in a modern car, at the front end of the frame, with the line of cylinders parallel to the side members. The drive was taken through a friction clutch (q.v.) to a reducing gear, and from the tail shaft through a differential gear (see *Gearing*), to a pair of axles driving the back wheels by chains. The final chain drive, except for some heavy cars and commercial vehicles, was later replaced by the line axle, which was operated by a differential gear from a long tail shaft. The maximum power of the engine is obtained at from 1500 to 2000 revolutions per minute. This motion is transmitted through the clutch to the gear-box. Full power is required from the engine when the road wheels are to turn slowly, as when climbing a hill. Gears must be introduced to reduce the speed of rotation. The lowest gear should be such that the power of the engine would be sufficient to drive the car up the steepest gradient at the speed it gives. Usually there are three gears. The shaft transmitting the power from the gear-box to the back axle has universal joints at its ends. This is called a cardan shaft, after Geronimo Cardano (q.v.), the inventor of this system of power transmission between shafts that are not parallel. In a motor-car the tail shaft is at a different angle to the engine shaft every instant. Differential gearing on the back axle drive is required, because the wheels may have to run at different speeds, as in turning a corner.

Motor-racing, introduced in 1894 by the proprietors of *Le Petit Journal*, who offered a prize for a race between Paris and Rouen, was useful to engineers who were endeavouring to improve the design and construction of motor-car mechanism. In 1902 S. F. Edge won the Gordon-Bennett Cup with his 50-h.p. Napier in the race from Paris to Vienna. In the British Isles motor-racing on highways was not allowed, except in Ireland and the Isle of Man, where the race for the Tourist Trophy was instituted in 1905. The Brooklands racing-track, near Weybridge, Surrey, was opened in 1907. The track circuit is 2 miles 5½ furlongs round the inner edge, and with the straight finishing run gives 3¼ miles. The banking rises 28¼ feet. The reliability trials organized by the Royal Automobile Club and the Royal Scottish Automobile Club demonstrated the weakness in design of cars intended for touring. The earlier trials showed that particular troubles were common to most cars, but were found to be entirely or almost absent from the experiences in later tests. The relationship of gear to power and the defective character of cooling systems were quickly demonstrated in the trials on the Scottish hill roads, and faults in lubrication, carburation, and ignition systems, and in brakes, were discovered in the course of these strenuous tests.

The motor-car engine and its cycles of operation are dealt with in the articles *Motor-car Engines* and *Internal-combustion Engines*.

Modern cars are provided with electric starters, each consisting of a small electric motor supplied with electricity from a battery, and used to turn the engine crank shaft by means of gear-wheels. After the engine is started the electric apparatus is used as a generator, which charges the battery and supplies electricity for lighting. One of the greatest advances with regard to brakes which has been made was the introduction of the four-wheel braking system. In this system brakes are fitted to the front wheels as well as to the back wheels, and the operating system is so arranged that the four brakes can be applied simultaneously, sometimes through the agency of a servo-motor or friction relay driven from the gear-box. Steel-spoked wheels of the detachable variety are used on the greater number of cars on the British market to-day. The disc wheel is of cheap construction, and allows central-pivot steering to be used. At the present time on the majority of cars, semi-elliptic laminated-leaf springs are used both back and front, though the increasing number of small motor cars on the road has resulted in a wider adoption of quarter-elliptic springs, particularly for the rear suspension. Although practically every car on the road to-day has a frame consisting of pressed steel channel-section side members braced together laterally with cross members, there is a good deal of difference of opinion as regards the amount of stiffness necessary in the construction. A rigid frame gives a vastly better support for the coachwork, but, on the other hand, a rigid frame may react against the suppleness of the car on its springs. It is noticeable, however, that there is a growing tendency to stiffen up frames laterally, and on several cars cross members consisting of very massive tubes are being fitted.

After the European War, when production costs were high, many motor manufacturers devoted themselves to the production of light cars which could be sold at a reasonable price. This development took many different lines, from that of manufacturers of high-powered expensive cars undertaking the production of a lighter and lower-powered model, to that of others who contented themselves with the production of three- or four-wheeled motor-cycles.

The endeavour to make a very low-priced cycle car has not met with the success expected. The motor-tricycle was invented in 1885 by Butler, and it was developed up to 1901, when the bicycle took its place. The progress of the cycle has been so considerable that there are more cycles in use than any other form of motor-driven vehicle. The engine may be of the two- or four-stroke type (see *Motor-car Engine*), and drives the back wheel by belt or chain, or both, through a reducing gear. The comfort of the rider depends largely on the nature of the springing, both of the frame and of the saddle.

The Triumph motor cycle is perhaps the most popular of all British cycles. The 4-h.p. model has an engine cylinder of 85-mm. bore and 97-mm. stroke, a three-speed gear, and a multiple plate clutch. An all-steel construction, with a welded petrol-tank replacing the two top tubes of the usual frame, is seen in the Beardmore-Precision. Cantilever springing is also a distinctive feature of this machine. Light-weight cycles with engines of 2¼ to 3 h.p. are very popular as solo machines. When a side-car is used, larger power, or an increased gear ratio, or both, are desirable. The heavy cycles, such as the 8-h.p. Matchless with its two-cylinder V-type engine, have such a reserve of power that almost any tour in Britain could be made without changing to the low gears. Good design of components of substantial dimensions, and engines of proven reliability, have been characteristic of the Matchless since C. R. Collier won the Auto-cycle Tourist Trophy with one in the first contest (1907). In 1922 the junior, lightweight, and senior trophies were won with A.J.S., Levis, and Sunbeam cycles.

The commercial motor vehicle is more used in Britain than in any other European country. The carriage of goods by horse-haulage diminishes as the knowledge of the cheapness and convenience of motor-traction extends. There are two main classes of work for which such vehicles are used: first, the transport of heavy goods, either within an industrial area or over long distances; and second, the direct delivery of very light articles from general stores to suburban houses.

The Albion commercial vehicle, of which nearly six thousand were supplied to the British War Office during the European War, is a good example of design to meet the requirements of the former type. The frame is of channel-section steel, with tubular cross members. The engine is a four-cylinder four-stroke one, all parts of which are lubricated by the Albion-Murray mechanical lubricator. The engine is provided with a governor to prevent racing, and thus keep down the wear and tear. A gate change speed gear is provided, with three forward speeds and one reverse. Every part of the vehicle is constructed of ample proportions to stand up to hard work and long-continued use. The Albion Motor Car Company manufacture models suitable to carry net loads of 25, 30, 50, 60, and 80 cwt.

For very light work Ford vans have been employed to the greatest extent.

Charabancs and motor-omnibuses have become most formidable competitors of the electric tramcar and railway train. Low first cost and maintenance charges, combined with sturdy and reliable construction and the ability to instantly change route, are substantial advantages possessed by the 'bus. Their use would relieve the congestion in the main streets of large industrial towns which has been greatly contributed to, if not entirely caused by, the installation of rail traction.—BIBLIOGRAPHY: *The Auto-car Handbook* (Messrs. Iliffe & Sons); H. E. Wimperis, *The Principles of the Application of Power to Road Transport*; H. J. Spooner, *Motors and Motoring*.

Moufflon, or **Mouflon**, the *Ovis musimon*, a wild sheep inhabiting the mountainous parts of Corsica. It is covered with short hair, generally of a reddish-brown colour, and the male has a powerful pair of horns. It is hunted for its flesh, and is difficult of approach; sometimes it is kept in a tame state. Another species (*O. ophion*) is peculiar to Cyprus. The name is also given to allied forms, such as the argalis, native to Mongolia (*O. ammon*) and Tibet (*O. nahura* and *O. hodgsoni*).

Mould, a name given to various saprophytic Fungi, especially to those which develop on stale comestibles (bread, jam, &c.), on damp leather, paper, and the like. The black moulds are species of Mucor (q.v.) and allied genera. The green mould is Eurotium; the blue, Penicillium.

Moulins, a city and capital of the department of Allier, France, a railway junction, on the River Allier. Wool, cutlery, hats, and glass are manufactured. The cathedral of Notre Dame was founded in the fifteenth century, and the remains of a castle of the ducs de Bourbon contains a Bible of date 1115. Moulins became the capital of the Bourbonnais in the fifteenth century.

Moulmein, a seaport in the Amherst district of the Tenasserim division, Lower Burma, on the Gulf of Martaban, to leeward of Pelew Gewen (Bilugyun) Island, and connected by rail with Rangoon and Pegu. Moulmein is the second port of Burma, and has large exports of teak and rice. Pop. about 58,000.

Mountain Ash (W. *Aberpennar*), a town of Glamorganshire, South Wales, near Aberdare, on the Cynon, a tributary of the Taff, and served by the Great Western and Taff Vale Railways. Coal-mining is important and almost the only industry. Pop. (1921), 43,292.

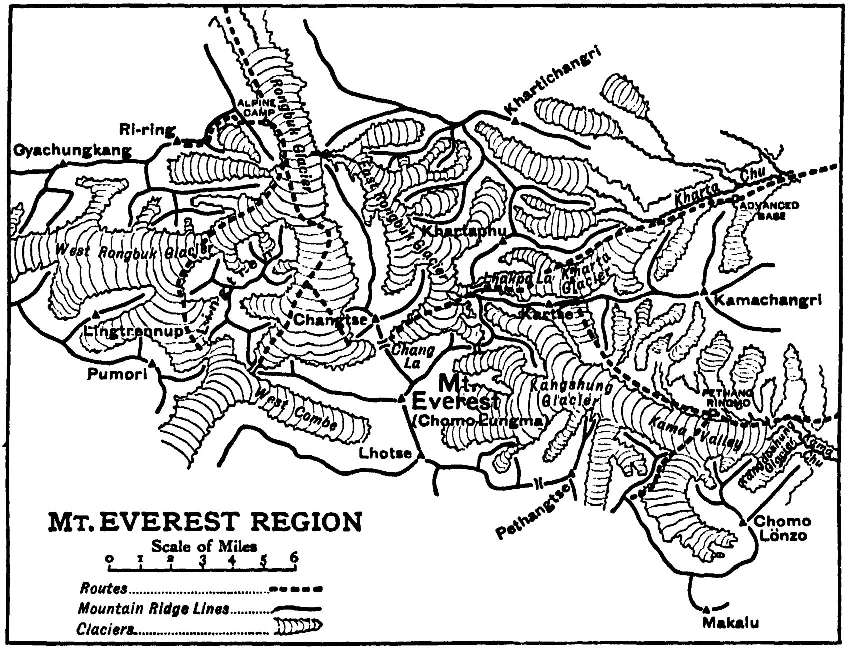
Mountain Avens, an Arctic or Alpine tufted rosaceous plant (*Dryas octopetala*), with simple petioled leaves and white and yellow solitary flowers. They are sometimes cultivated in rock gardens.

Mountain-limestone, a series of marine limestone strata, whose geological position is immediately below the Upper Carboniferous zones and above the Old Red Sandstone in England.

Mountbatten. See *Battenberg*.

Mount Everest Expedition. Mount Everest, the highest mountain in the world, standing on the frontier between Nepal and Tibet, was triangulated in 1849. It was then known to the Survey of India as Peak XV. It was not until some years later that the figures of its triangulation were worked out and the Bengali chief computer came into the Surveyor-General's office to announce that his calculations had established the pre-eminence of this peak, 29,002 feet high. It was agreed that it should be called after Sir George Everest, the Surveyor-General responsible for the triangulation of 1849. The Tibetan name is *Chomo-Lungma*, which is interpreted as 'The Goddess Mother of the World'.

The idea of exploring the mountain first took definite shape in 1893, when the Hon. C. G. Bruce, then a captain in the Indian army, and Sir Francis Younghusband, second in command at Chitral, intended to travel across Tibet to Tingri, 45 miles north-west of Mount Everest. But political difficulties were in the way then, as always afterwards whenever a plan was suggested, until 1920. Tibet and Nepal alike were closed to travellers. Meanwhile Dr. Kellas, in the course of his ubiquitous mountaineering in Sikhim, had sent coolies over into Tibet and found out much about the eastern approaches; he made plans by which he hoped to outwit the Tibetan authorities. Captain Noel, too, had been to Tashirak in Tibet, 45 miles east of the mountain, and was in hopes of reaching a pass where, it was reported, the lamas of a local monastery used to go to worship Chomo-Lungma; but the local Governor came along with his guards, and Captain Noel was forced to retire without seeing his view. He related these adventures to the Royal Geographical Society in 1919; and in the discussion following his paper a plan was made in conjunction with the Alpine Club. The Indian Government was approached; Lord Chelmsford was favourable to the enterprise, and at last the Dalai Lama gave permission for a limited number of Englishmen to pass through Tibet. A committee was formed and the party was selected, Colonel Howard Bury to be chief, and Dr. Kellas, Messrs. Raeburn, Leigh-Mallory, and Bullock to be the climbing party. To these were to be added two members of the Survey of India, Major Morshead and Captain Wheeler; and Dr. Heron of the Geological Survey. The party left Darjeeling on 18th May, and followed the trade route to Lhasa as far as Phari Dzong. In the bleak country of pitiless wind between there and Kampa Dzong they fared ill. Dr. Kellas, after being carried five days in some sort of litter rigged up for the occasion, died on the last march coming over a high pass to Kampa Dzong; and Mr. Raeburn was too ill to go farther. On 20th June the expedition reached Tingri Dzong, which was to be used as a base for the northern approach, as General Bruce had intended twenty-eight years before. Messrs. Bullock and Mallory, the only remaining representatives of the Alpine Club, now found their way to the Rongbuk Valley, at the head of which stands Mount Everest. It was a small party, with only sixteen coolies, a sirdar, and a cook, besides the two sahibs. But the coolies were men of a fine stock, from the tribe of Sher Pa Bhotias, who inhabit a part of Nepal not far from Everest itself; about forty of these men had volunteered for the expedition, and the sixteen had been selected from them. Accustomed as they are to carry loads over all sorts of rough ground, sturdy and extraordinarily enduring in both cold and heat, probably no better men could be found for the exacting work of mountaineering porters. The reconnaissance had three aims: to examine the approaches to various sides of the mountain, to determine its form in every particular so far as possible, and to find out its vulnerable places



and that one which should offer the best line of attack.

Mount Everest may be described as consisting primarily of three great ridges set at a wide angle and meeting at the summit. Of these the south ridge, after descending about 1500 feet, goes up to another great peak 28,000 feet high, Lhotse (South Peak), and there divides, sending out one arm which curves round to the south-east, and another which curves round to north-west. The other two ridges are simple: the north-east goes down only 1000 feet in half a mile to a conspicuous rocky shoulder, and then plunges more steeply down to 21,000 feet; the north-west ridge descends very steeply for about 4000 feet, then very gently for 2000 feet, making an immensely long structure like the nave of a cathedral with its roof covered by snow, until it plunges down suddenly to a pass at 19,000 feet. It may be gathered that none of these ridges encourages the idea of conquering the summit. And the faces are no better. The south face between the two arms of the south ridge has not been explored; but a distant photograph shows it to be a series of rocky precipices; the east face is glaciated in its upper half, and the steep rocks lower down must be continually bombarded by the broken ice-cliffs in which the hanging glacier ends; the west face cannot be used for an ascent for reasons which will appear later; and the north presents itself as a prodigious precipice 10,000 feet high. But here lies a complication. It is not a single mountain-side facing north. Some distance to the east of the summit it is bent back so that the whole is divided by a wide-angled ridge coming down from the north-east shoulder and ending in a snow col at 23,000 feet. This snow col, Chang La (North Col), is a link connecting Mount Everest with a whole series of mountains to the north. And though the lower part of the north face can nowhere be climbed, the upper slopes are not so steep; by climbing first to Chang La it is possible to reach them; the wide dividing ridge is almost certainly accessible, and the angle of the north-east ridge above the shoulder is so gentle as to give some hopes that the highest mountain may one day be climbed by this route.

It was the achievement of the reconnaissance party of 1921 to establish this possibility. They spent a month exploring the north and west sides from the Rongbuk Valley, and found many difficulties to contend with. Not the least was the sun's power. The latitude of Mount Everest is only 28° north, and the sun is able to melt the surface of a glacier into spires of white ice 40 and 50 feet high, or enormous waves and troughs where it is covered with stones. Travelling over such ground was extremely laborious, and the glare from snow and ice had the effect of increasing the feeling of lassitude from which men constantly suffer when exerting themselves strenuously at high altitudes. On 7th July the monsoon broke in earnest, and from that date onwards it was the general rule that clouds should come up even on the finest days, perhaps an hour after sunrise, to obscure the mountains until evening. Under these circumstances the party suffered many disappointments, and the western side of the mountain long remained a mystery. But camps were pushed up, the coolies were taught the necessity of early starts at 2 or 3 a.m., and eventually, by reaching a high pass at sunrise, it was established that a deep combe exists between the north-west ridge of Everest, the South Peak, and its north-west arm; a glacier flowing from it descends into Nepal, and it would be impossible to use it without organizing an expedition in that country; in any case, it is so steep that it could hardly be used for bringing up camps; and from what they saw the explorers conjectured that little but impracticable precipices would be found on this western side—so that on all counts it must be ruled out for the purpose of climbing the mountain. Other expeditions up to the head of the Rongbuk Glacier under the north face yielded views of the west side of Chang La (North Col), and it was decided that this place was impracticable.

In the last week of July the expedition base was moved round to Kharta for the reconnaissance of the east side. In striking contrast with the barren northern valley, this country was green with pastures and barley. Kharta is situated on the west bank of the Arm River, which cuts through the Himálaya and flows through Nepal into the plain of India. The monsoon pushes its way up as far as Kharta, and to some extent also up the eastern valleys, in the lower parts of which was found a wealth of vegetation. From Kharta the Kama Valley, leading up to the east face of Mount Everest, was first explored. For magnificence of scenery it is probably unequalled. Besides Everest itself and Lhotse at the head of it, Makalu overlooks it from the south-east, the fifth highest summit in the world and one of the most glorious of mountains. But from the climbing point of view the result was negative. From a peak of over 21,000 feet, the Kartse, it was easily established that no reasonable line of attack could be chosen on either the east face or north-east arête. It was a further object to find the glacier which must approach the eastern side of Chang La. It was conjectured that this glacier would flow eastwards; but in reality it flows northwards. The next glacier north of the Kama Valley and flowing east, the Kharta Glacier, ends under a high pass at 22,500 feet, Lhakpa La (Windy Gap), which looks down across the head of the East Rongbuk Glacier to Chang La. This pass was reached on 18th Aug. after the most exhausting efforts; but clouds obscured the view so that the wall under Chang La could not be seen.

With this uncertainty remaining, the assault was planned for September, to bring the party if possible to Chang La and a considerable distance up the mountain above it. In the normal course the monsoon is spent by the beginning of September and fine weather sets in. The issue depended on the snow's hardening; the coolies could not be expected to carry their loads in soft snow over Lhakpa La. The weather cleared on 17th Sept., and on the 20th Lhakpa La was reached again with the beginning of a camp, but not without great difficulty; the season was now too late, and the snow melted very little above 21,000 feet. However, it was possible, once the tracks had been made, to establish the whole party on Lhakpa La two days later—Colonel Howard Bury, A. F. R. Wollaston (medical officer-naturalist), and the two surveyors, besides Messrs. Bullock and Mallory. On the 22nd it was found that of twenty-three coolies all but ten were *hors de combat*; only three sahibs could go on with the limited transport, and Major Wheeler of the Canadian Alpine Club was added to the climbing party. The way forward was easy to the foot of the wall under Chang La, where a further camp was made. This wall, a formidable obstacle, was climbed on the 24th, and the three sahibs with three coolies reached Chang La (about 23,100 feet). But they were met there by a terrific wind from the north-west blowing up the snow, so that a further advance was impossible either on this or subsequent days. The condition of snow and ice and rock on the higher parts of Mount Everest are still a matter of conjecture. It is thought that the best season for attempting the ascent will be in early June before the monsoon; it is possible that then the rocks will be clear in many places and even the highest snow will be solid. It is not the climbing obstacles that will be most likely to turn a party back; the rock, which is almost certainly mica schist, should not prove too difficult. But the great effort of breathing at very high altitudes is extremely exhausting. The expedition of 1922 is provided with an oxygen apparatus, and their success or failure must depend very largely on its efficiency.

Whether or not the highest summit of the world will ever be reached by climbers, it has been established that it is worthy of its fame—a vast mountain mass raised upon gigantic limbs more than head and shoulders above its great neighbours, noble, pre-eminent, imposing.—Cf. Lt.-Col. C. K. Howard Bury, D.S.O., *Mount Everest: the Reconnaissance, 1921.*

Mount Vernon, a city of New York, United States, in Westchester county, and on Bronx River; served by the New York, New Haven, & Hartford and other railways. It was founded in 1852, became a city in 1892, and is a north residential suburb of New York City. Pop. (1920), 42,726.

Mourne Mountains, a mountain range of Ireland, in the south of County Down, extending for 15 miles in a north-easterly direction between Carlingford Lough and Dundrum Bay; Slieve Donard reaches an altitude of 2796 feet.

Mourning, as the outward expression of grief, has greatly varied at different times and among different nations. Thus the Eastern nations and the Greeks cut off their hair, while the Romans allowed the beard and hair to grow; and as an evidence of mourning the ancient Egyptians wore yellow; the Ethiopians, grey; the Roman and Spartan women, white, which is still the colour of grief in China, Japan, and Siam; in Turkey, blue and violet; and in the other European countries black is used for this purpose. The Jews, in sign of grief at the loss of their relatives, rent their garments, tore out their hair, and wore coarse garments of a dark colour; and with the Greeks and Romans it was the custom to lay aside all ornaments of dress, to abstain from the bath and other indulgences.

Mourzouk. See *Murzuq*.

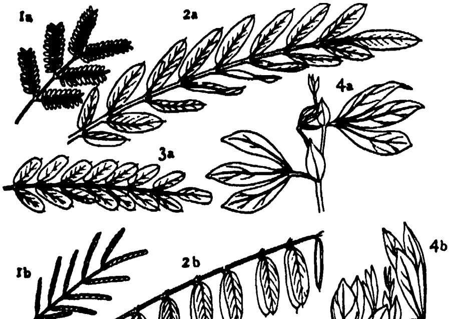
Mouse, the name of a number of small rodents of which the most familiar is the domestic mouse (*Mus muscŭlus*), too well known to need description. The harvest-mouse (*Mus messorius* or *minŭtus*), the smallest British quadruped, is a hibernating mammal, and constructs a little nest of grass, &c., entwined round and supported by the stalks of the corn or wheat. The common field-mouse (*M. sylvaticus*) is a dusky brown, with a darker strip along the middle of the back, whilst the tail is of a white colour beneath. The short-tailed field-mouse, or 'meadow-mouse', is not a true mouse, but one of the voles (Arvicŏla). It is of a reddish-brown colour, inclining to grey, the under parts are lighter, or ashy-brown, and the tail and feet are of a dusky-grey colour. The dormouse also is of a different family from the true mice.

Mouse-ear Chickweed (Cerastium), a genus of plants, nat. ord. Caryophyllaceæ, consisting of many pubescent herbs with small leaves and white flowers, forming common weeds in all temperate and cold regions. Nine species of the genus are found in Britain.

Mousquetaires, a pre-Revolutionary body of French Household Cavalry, comprising two companies, the 'Grey' and the 'Black'. The first was formed by Louis XIII in 1622. Charles de Batz, comte d'Artagnan (1621–72), a real personage, immortalized by Dumas père (*Trois Mousquetaires*), was their most celebrated captain. The Mousquetaires were definitively suppressed in 1815.

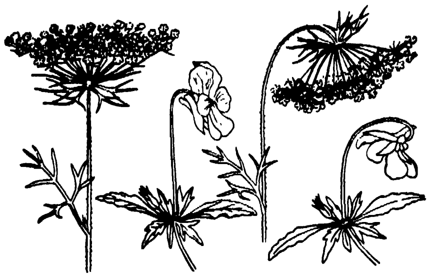
Mouth, the aperture in the head of an animal through which food is received. It is central in radially symmetrical animals, such as starfishes and polyps; or generally the anterior opening of the alimentary canal. In the higher animals the use of the mouth is for mastication, the emission of sound or voice, deglutition, and taste. In many animals of a low type of structure there is no distinct mouth. Thus in the simpler Protozoa (e.g. Amœba) the food is taken into the interior of the body by a process of ingestion, any portion of the surface being chosen for this purpose, and acting as an extemporaneous mouth, which closes up again when the particle of food has been received into the body. Some parasites, such as tapeworms, are devoid of mouth or special digestive organs.

Movements of Plants, though generally much less obvious and consequently less familiar than those of animals, are nevertheless numerous, varied, and important. Some unicellular plants (e.g. Chlamydomonas), the zoospores of Algæ and Fungi and the male gametes of most groups of plants, are actively motile. *Circulation* or *rotation* of *protoplasm* within living cells can be seen in many plants if a suitable object, such as one of the thin, translucent leaves of Elodea, or a hair from a leaf-stalk of Primula or from a stamen of Tradescantia or scarlet pimpernel, be mounted in water (preferably at 20° to 30° C.) and examined under a microscope. An actively growing shoot or root does not travel forward in a straight line, but shows what is called *circumnutation*, i.e. it bends successively in different directions, owing to inherent irregularities of growth; this fact can be demonstrated by noting the position of the tip at intervals, or, more strikingly, with the aid of the cinematograph.



Movements of Plants

Fig. 1.—Day and night positions of leaves of 1, *Mimosa Lindheimeri*. 2, *Amorpha fruticosa*. 3, *Coronilla varia*. 4, *Tetragonolobus siliquosus*.



Movements of Plants

Fig. 2.—Curving of flower stalks of carrot and pansy (right)

Other movements of plant-organs are related to various external influences (*stimuli*), such as gravity, light, moisture, oxygen, and contact or shock; these are termed *paratonic*, in contradistinction to such *autonomic* movements as circumnutations, which are not directly induced by agencies outside the plant. Young organs carry out such movements by means of unequal elongation in the still growing region (for details, see articles on *Chemotropism*; *Geotropism*; *Haptotropism*; *Heliotropism*; *Irritability*; &c.). Parts which have ceased to grow are often still capable of motion through alterations of turgor—witness the 'sleep-movements' of many compound leaves (e.g. wood-sorrel or clover), and the behaviour of 'irritable' stamens and stigmas; the startlingly rapid movements of the Venus' Fly-trap (Dionæa) and of the sensitive plants (Mimosa, &c.) belong to this class. Almost all movements serve some useful purpose in the economy of the plant.—BIBLIOGRAPHY: C. R. Darwin, *Power of Movement in Plants*; L. Jost, *Lectures on the Physiology of Plants* (translated by R. J. Harvey Gibson).

Moving Plant, or Telegraph Plant (*Desmodium gyrans*, nat. ord. Leguminosæ), a native of India, often cultivated in Europe in stoves, having violet flowers, and leaves consisting of two lateral leaflets and one larger terminal leaflet. It is remarkable for the motions of its leaflets, which are constantly twisting about in a variety of ways, especially under the influence of light and heat.

Mozambique, Province of. See *Portuguese East Africa*.

Mozambique, San Sebastian de, a seaport-city of Portuguese East Africa, on an island 3 miles off the Mosuril Bay coast. It has fortifications, erected by the Portuguese in 1508, and a number of other antiquated erections. As a port and former capital of the province of Mozambique it has declined mainly through the rise of Lourenço Marques. Pop. estimated at 4500.

Mozambique Channel, the passage between the east coast of Africa and the Island of Madagascar. In its north part lie the Comoro Islands.

Mozar'abs, a name applied by the Moorish Mahommedans in Spain to the Christians among them who retained their own religion. The Mozarabic liturgy which they used was suppressed, but was revived at Toledo and at Salamanca, where it is still preserved.

Mozart (mo-zárt'; Ger. pron. mō'tsárt), Johann Chrysostomus Wolfgang Amadeus, German composer, was born at Salzburg 27th Jan., 1756, and died at Vienna 5th Dec., 1791. At the age of four years his father, Leopold Mozart, a violinist of repute, began to teach him some minuets and other small pieces on the harpsichord. From this period he made rapid progress, and a concerto for the harpsichord, which he wrote in his fifth year, was so difficult that only the most practised performer could play it. In his sixth year Mozart was taken by his father, along with his sister, to Munich and Vienna, where the little artists were received at court with great favour. In 1763 the family made a journey to Paris, where Mozart published his first sonatas for the harpsichord; and in the following year they proceeded to England, where the child-musician performed before the court the most difficult compositions of Bach and Handel. In 1767 the family returned to Salzburg, and in 1769 Mozart, who had been made master of the concerts at the court orchestra at Salzburg, commenced a journey to Italy in company with his father. In Rome he wrote down, on hearing it, the famous *Miserere*, annually sung in the Sistine Chapel during the holy week. At Milan in 1770 he composed, in his fourteenth year, his first opera, *Mithridates*, which was performed more than twenty times in succession. Henceforth he resided chiefly in Salzburg, but also visited Paris, Munich, and finally Vienna. In the last-named city, although he was appointed composer to the court, he found it necessary to maintain himself by giving lessons in music and writing waltzes. Notwithstanding this poverty, it was here that most of his best work, such as his famous operas *Le Nozze di Figaro* (The Marriage of Figaro), *Don Giovanni*, *La Clemenza di Tito* (Clemency of Titus), *Die Zauberflöte* (The Magic Flute), and his last work the *Requiem*, were written. It was here also that the best pianist and greatest composer of his time—perhaps of the world—died in obscurity and was buried in a pauper's grave. The extent of work done by Mozart during his short life is almost incredible, and in every department of composition, whether vocal or instrumental, he excelled. In the history of music he stands most prominently forward as an operatic composer, his *Don Giovanni*, *Magic Flute*, and *Marriage of Figaro* being works previously unequalled and never since surpassed. In his character he was kind-hearted, guileless, cheerful, void of envy, almost boyish to the last.—BIBLIOGRAPHY: E. Holmes, *Life of Mozart, including his Correspondence*; F. H. Cowen, *Mozart and his Music*; E. J. Dent, *Mozart's Operas: a Critical Study*.

Mucilage, a solution of some gummy substance in water, having a certain degree of viscosity. Gum-arabic, dextrine (British gum), and gum-tragacanth are the ingredients most commonly employed. Gum-acacia, the purest form of gum-arabic, dissolves completely in hot water. It is used as an adhesive, with the addition of a small quantity of glycerine or sugar to prevent it from hardening and cracking when dry. Dextrine is best dissolved in cold water; it is the adhesive commonly used on stamps, labels, envelopes, &c., and also for thickening colours used in calico-printing. Gum-tragacanth does not completely dissolve, but absorbs fifty times its own weight of water to form a thick mucilage which is the basis of many hair-creams and other toilet preparations. In medicine it is used to suspend insoluble substances, and is also applied to irritated mucous membranes. Other mucilages are made from the cherry tree gum, starch, sassafras pith, elm gum, linseed, barley, &c.

Mu'cius Scævola (sē'vo-la), the hero of a Roman legend to the effect that, having attempted to assassinate Porsenna, King of Etruria, Mucius was ordered to be burned alive, but he won the king's favour and pardon by fearlessly holding his hand in the fire.

Mucor, a genus of saprophytic Fungi, group Zygomycetes, easily recognized by their pin-shaped erect reproductive branches (*sporangiophores*), each ending in a black sporangium. Animal excreta form the natural medium of most species, but several grow readily on stale bread, decaying fruit, &c., especially *M. mucedo* and *M. stolonifer* (*Rhizopus nigricans*), which are the familiar black moulds.

Mucus, a viscid fluid secreted by the mucous membrane of animals, which it serves to moisten and defend. It covers the lining membranes of all the cavities which open externally, such as those of the mouth, nose, lungs, intestinal canal, urinary passages, &c. It is transparent, glutinous, thready, and of a saline taste; it contains a great deal of water, chloride of potassium and sodium, lactate of sodium and of calcium, and phosphate of calcium. Mucus forms a layer of greater or less thickness on the surface of the mucous membranes, and it is renewed with more or less rapidity. Besides keeping these membranes in a moist and flexible condition, it also protects them against the action of the air, of the aliment, the different glandular fluids, and agencies that might otherwise irritate and inflame.

Mudar, the Indian name of *Calotrŏpis gigantea*, a shrub or small tree of the nat. ord. Asclepiadaceæ, and also given to a substance used medicinally in India with great alleged effect in cutaneous diseases, and obtained from this and another species (*C. procĕra*). The inner bark of *C. gigantea* also yields a valuable fibre.

Mud Fever, in horses, an ailment similar to cracked heels, involving an inflamed condition of the skin of those parts of the horse most spattered in wet weather, as the back of the front legs, the front of the hind ones, the thighs, belly, and chest. Hunters are the chief victims. Washing with warm water provokes mud fever, and allowing mud to dry on horses whose legs have not been clipped confers a large degree of immunity. Considerable inflammation, swelling of the legs, symptoms of fever, and stiffness characterize the disease. Much hair is lost. A soothing application of glycerinated water (5–10 per cent) should be applied warm and thoroughly dried off, followed by a weak coal-tar disinfectant and further drying. An ointment of 1 part of red oxide of mercury to 7 parts of vaseline or lanoline may be used, and is best applied by smearing it on tow or cotton-wool, followed by bandaging of the parts affected. A few cooling saline doses facilitate recovery, which in simple cases generally takes place in about a week.

Mudros, a town and bay on the south coast of the Ægean Island of Lemnos, where the armistice was signed between the Allies and Turkey on 30th Oct., 1918 (European War). Throughout the Gallipoli campaign the extensive landlocked harbour of Mudros formed a naval base (H.M.S. *Europa*, depot ship). The town and adjacent plain were packed with French, British, European, and coloured troops throughout the operations.

Mudstone, a term originally applied to certain dark-grey fine-grained shales of early Palæozoic age, but now extended to all similar shales in whatever formation they may occur.

Muez'zin (Ar. *mu'addin*, from *addana*, to proclaim), a crier in Mahommedan countries who calls the faithful to prayer five times a day—at dawn, noon, 4 p.m., sunset, and midnight, as prescribed by the Prophet. The call is usually made from a minaret or from a roof-top, and takes the traditional form of 'God is great' (thrice), 'There is no God but God' (twice), 'Mahomet is the Prophet of God' (twice), 'Come ye to Prayer' (twice), 'God is great' (twice), 'And there is no one like unto Him'. The muezzin is appointed by the imam of the mosque, and a seat in Paradise is reserved for him *ex officio*.

Muffle, in metallurgy, an arched fire-brick furnace heated by gas, coke, or electric current. It is used in various metallurgical operations, such as the roasting of certain sulphide ores where it is desirable to keep the sulphur dioxide free from the gaseous products of combustion of the fuel used. Various forms are also used in the heat treatment of metals and alloys for operations such as hardening, annealing, &c., and in the assay laboratory for such operations as scorification and cupellation.

Mufti, literally (in Mahommedan countries) an expounder of the law in accordance with Koranic precept and traditional practice. Generally, a cadi approaches a mufti for a ruling upon some definite point of the canon law, and his decision takes the form of a *fetwa* (document) by which the general decision is applied by the cadi to meet a particular case. In Turkey there is a grand mufti, styled the Sheikh-ul-Islam, appointed by the Sultan, who can dismiss him, but who can also be deposed by *fetwa* of the Sheikh, as in the case of Abdul Hamid.

Muggletonians, a sect that arose in England about the middle of the seventeenth century (1651), of which the founders were John Reeve and Ludovic Muggleton, who claimed to have the spirit of prophecy. They affirmed themselves to be the 'two witnesses' of *Rev.* xi, 3. The sect lasted until the middle of the eighteenth century.

Muharram, a religious festival and the first month of the Mahommedan year. Broadly speaking, Mahommedans are divided into two main sects, known as Sunnites and Shiites. The former acknowledge all the successors of Mahomet, while the latter reject many of them and pin their faith on Ali—the son-in-law of Mahomet—and his two martyred sons, Hassan and Hussein. It is the murder of these two which is commemorated at the Muharram. In India, where the Mahommedan population is almost exclusively Sunni, and as such might be expected to ignore the deaths of the saints of a rival sect, both classes join whole-heartedly in the Muharram celebrations, which are often made the excuse for falling foul of the Hindus. Numerous acts, such as killing a cow in front of a Hindu temple, are occasionally perpetrated, and acknowledged in kind by the offended Hindus. As a rule these disturbances take place only in the larger towns, though they have been known in country districts; but more often than not the Muharram celebrations, consisting of the immersion of the *taziya* or bier of the martyred brothers, passes off quietly, without any physical exposition of the hatred felt by all good Mahommedans towards all good Hindus, and vice versa.

Mühlhausen, a town of Prussian Saxony, on the Unstrut. It has two fourteenth-century churches and a mediæval town house. Woollen and cotton cloth, leather, and sewing-machines are made. Mühlhausen was originally in Thuringia, became a free city until 1802, and was incorporated in Prussia in 1815.

Muir, John, a Sanskrit scholar, born at Glasgow in 1810, died 1882. He was educated at the university of his native city, and joined (1828) the East India Company's Civil Service, filling various offices until his retiral in 1853. His chief works are: *A Sketch of the Argument for Christianity against Hinduism, in Sanskrit Verse* (1839); and *Original Sanskrit Texts on the Origin and History of the People of India, their Religion and Institutions* (5 vols., 1858–70).

Muir, Sir William, Arabic scholar and brother of the above, was born at Glasgow in 1819, died in 1905. He was made principal of Edinburgh University in 1885. His writings include: *The Life of Mahomet* (1858–61), *Annals of the Early Caliphate* (1883), *The Corân* (1877), and *Mahomet and Islam* (1884).

Muirkirk, a town of Ayrshire, Scotland, on the Caledonian and Glasgow & South-Western Railways. It has coal- and iron-mines. Pop. (1921), 4726.

Mukden, or **Feng-Tien**, a city and capital of Feng-Tien province, Manchuria (of which it is also the capital), on the Peking-Mukden and South Manchurian Railways. The tombs of the imperial Manchu family are near by. Mukden was opened to foreign trade in 1908. 800,000 men were engaged in a terrific battle around Mukden during the Russo-Japanese War (19th Feb. to 11th March, 1905), when the Japanese were victorious. During the Chinese Civil War of 1922 Mukden was the base of Marshal Chang-Tso-lin's pro-Japanese army (known as the Fengtien army). In the Changsintien (near Peking) sector General Wu-Pei-fu's Chihli army engaged the Fengtien forces, and a tremendous battle ensued (3rd to 5th May) when the flank of the 'Mukden war-lord's' army was turned, their losses being estimated at 5000 dead, and 20,000 wounded or captured.

Mulai Hafid, Sultan of Morocco, born in 1875. He ascended the throne in 1906, but was forced to abdicate in favour of his brother, Mulai Yusef, on 11th Aug., 1912.

Mulberry, a fruit-tree of the genus Morus, nat. ord. Moraceæ, akin to the Urticaceæ or nettles. The black or common mulberry (*Morus nigra*) is the only species worthy of being cultivated as a fruit-tree. The fruit is used at dessert, and also preserved in the form of a syrup. The juice of the berries mixed with that of apples forms a beverage of a deep port-wine colour, called mulberry cider. The tree thrives in England, but is probably not originally a native of Europe. The white mulberry (*M. alba*) is the most interesting of the genus, on account of its leaves being used for food by silk-worms. It grows to the height of 40 or 50 feet, with a trunk 2 or more feet in diameter. It came probably from China. The red mulberry (*M. rubra*) has fruit of a deep-red colour, and is a valuable American tree. The paper mulberry (*Broussonetia papyrifĕra*) is a distinct genus, belonging originally to Japan, and now much cultivated in Europe. In Japan its bark is used in making paper, and its wood is highly valued for ornamental work.

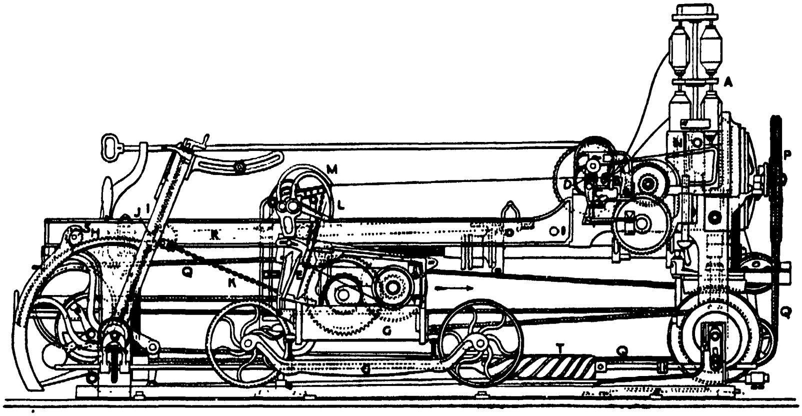
Mule, the name applied to any animal produced by the crossing of different species, but specifically denoting the hybrid generated between an ass and a mare. The head of the mule is long and thin, its tail is bushy, and its mane short. (See *Hinny.*) The mule is employed as a beast of burden in Spain, Portugal, Italy, in the East, and in Spanish America. It unites the speed of the horse with the dogged perseverance of the ass, and was extensively employed by the British during the European War. Zebroids are mules produced by crossing the zebra and horse.

Mule, a spinning-machine invented by Samuel Crompton in 1775, and so called from being a combination of the drawing-rollers by Arkwright and the spinning-jenny by Hargreaves. Condenser bobbins for wool, or rovings for cotton, are supported in suitable bearings behind the mule, and are capable of rotating to give off the rove when drawn by the rollers. The rollers rotate intermittently, and the spindles are supported by bearings in the carriage. The carriage, on wheels, moves on rails outwards, or away from the rollers, to a distance of about 6 feet, and then returns. The rollers rotate to give off the rove while the carriage is moving outwards for half its distance and then both stop; for the remainder of the outward travel the rove is drawn out, or attenuated, to a smaller diameter (to that required for the yarn in work). The spindles rotate rapidly to impart the necessary twist, but, as the carriage is moving in towards the rollers, each length of spun yarn (approximately 6 feet), and there may be several hundreds, is wound on to its spindle by the rotation of the latter, and simultaneously shaped by the fuller wires to the well-known cop form. In each cycle the speed of the spindles varies for different functions. (See illustration on p. 28.)

Mülheim-am-Rhein, a German river-port, in the Rhine province of Prussia, facing Cologne. There is a good harbour; tobacco, machinery, electrical goods, and chemicals are manufactured. It became a corporate town in 1822. Pop. 58,000.

Mülheim-an-der-Ruhr, a German river-port, in the Rhine province of Prussia, on the Ruhr, and in the Westphalian coal- and iron-field. Coal is shipped from the harbour; glass, leather, zinc, and machinery are representative manufactures. Pop. 112,580.

Mulhouse (Ger. *Mülhausen*), a town of France, in the former district of Alsace, on the Ill. It is a cotton-manufacturing town, but has also industries of woollens, chemicals, hardware, and machinery. There is a mediæval town hall. Mulhouse became a free city in 1198, and fell to France in 1797. In 1871 it passed to Germany, and although occupied by the French in Aug., 1914 (European War), it was recaptured by the Germans and held by them until the conclusion of peace. Pop. 95,000.



Side Elevation of Cotton Mule

A, Creel. B, Back drawing rollers. C, Middle drawing rollers. D, Front drawing rollers. E, Spindle. F, Tin roller. G, G, Mule carriage. H, Quadrant attached to radial arm. I, J, Movable nut driven by screw within I, and adjusting the length of the chain K. L, Faller. M, Counter faller. N, Driving pulley. O, Loose pulley. P, Rim pulley. Q, Q, Endless cord driving the spindles. R, Beam lever controlling the drawing-roller mechanism. S, Pinion actuating the quadrant H. T, Spiral roller actuated by the counter faller and controlling the rate of motion of the nut J.

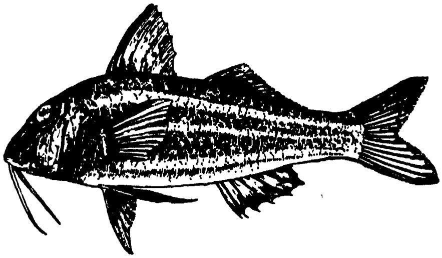
Mull, an island of the Hebrides, in Argyllshire, Scotland, separated from the Argyllshire coast by the Sound of Mull and the Firth of Lorne. It is mountainous (Ben More, 3185 feet), with several lochs, and a deeply indented coastline. Sheep and cattle are raised; granite is quarried and exported. Tobermory is the principal town. Pop. 4000.

Mullah, a Mahommedan teacher, or one learned in both canon and civil law. In India the term is applied to a schoolmaster. Fanatical Mullahs (' Mad ' Mullahs) have in recent times preached ' jehads ' in India and Somaliland, and in the latter country British punitive expeditions were undertaken between 1901 and 1905.

Mullein (mul'en), the common English name for the plant *Verbascum Thapsus*, nat. ord. Scrophulariaceæ. The common mullein grows in old fields, at road-sides, &c., and is a tall, rough plant. The flowers are yellow, almost sessile, and are disposed in a long cylindrical spike.

Müller (mül'ėr), **Friedrich Max**, a German philologist, son of the German poet Wilhelm Müller, was born at Dessau in 1823, died at Oxford in 1900. In 1846 he came to England and established himself at Oxford, where he was appointed successively Taylorian professor of modern languages (1854), assistant, and ultimately sub-librarian at the Bodleian library (1865), and professor of comparative philology (1868). His numerous writings include an edition of the *Rig-Veda* (6 vols., 1849–74), *History of Sanskrit Literature* (1859), *Lectures on the Science of Language*, *Chips from a German Workshop*, and *On the Origin and Growth of Religion* (1878).

Mullet, a name common to two groups of spiny-finned fishes, viz. the family Mugilidæ, or grey mullets; and the family Mullidæ, or red mullets. Naturalists, however, generally restrict the name to the former, designating the red mullets as surmullets. Of the true mullets the best known is the common or thin-lipped grey mullet (*Mugil capito*), which ranges from Scandinavia to the Cape, found round the shores of the British Islands, and in particular abundance in the Mediterranean. It grows to the length of 18 to 20 inches, and will sometimes weigh from 12 to 15 lb. It has the habit of rooting in the mud or sand in search of food. Another species, also called grey mullet (*M. cephalus*), a native of the Mediterranean, is distinguished by having its eyes half covered by an adipose membrane. It weighs usually from 10 to 12 lb., and is the most delicate of all the mullets. A smaller species, the thick-lipped grey mullet (*M. chelo*), is common on the British coasts. Many other species, natives of India and Africa, are much esteemed as food.



Striped Mullet or Surmullet

Mulready, William, was born at Ennis, Ireland, 1786, died 1863. He became a student of the Royal Academy about 1800; exhibited *The Rattle* (1808); *The Music Lesson* (1809), at the Royal Academy; and his *Idle Boys* (1815) secured his election as an associate of the Academy, while the following year he was elected as Academician. Among the most popular of his numerous pictures after this time were: *The Wolf and the Lamb* (1820), *The Last In* (1835), *The Seven Ages of Shakespeare* (1838), *The Sonnet* (1839), illustrations to *The Vicar of Wakefield* (1840), *The Whistonian Controversy* (1844), *Choosing the Wedding Gown* (1845), *Burchell and Sophia* (1847), *Women Bathing* (1849), and *The Toyseller* (1861).

Multan′, or **Mooltan′**, a division of the Punjab, India. The people are mainly Mahommedan. Wheat and cotton are produced. Area, 31,218 sq. miles; pop. 3,821,000.

Multan, or **Mooltan**, a city of India, in the Punjab, the chief city and capital of a district of the same name, is situated 4 miles from the Chenab. The streets are mostly narrow and tortuous. It is one of the most ancient cities in India, and is the centre of a large trade. Pop. 99,243.—The district of Multan comprises the south of the Bari doab. Wheat is produced by the use of irrigation. Area, 6107 sq. miles; pop. 815,000.

Multiple-poinding, in Scots law, double-poinding or double-distress. It gives rise to an action by which a person possessed of money or effects which are claimed by different persons obtains an authoritative arrangement for the equitable division thereof among the different claimants. It corresponds to *interpleader* in English law.

Multivalves. See *Mollusca.*

Mummies. The practice of embalming the dead was probably invented by the ancient Egyptians about 3500 B.C.; and the idea of attempting so remarkable a procedure was probably suggested by the fact that bodies buried in the sands of Egypt were often preserved as the result of a natural process of desiccation, and the idea developed that for the continuance of existence after death the preservation of the body from corruption was essential. The most important ingredient of the preservatives used was common salt, but from the earliest times various resins were also employed, and the body was wrapped in great quantities of linen bandages, sometimes as much as 300 yards being used. The earliest-known mummy belonged to the time of the Second Dynasty; but the only early mummy that was strong enough to be moved is probably to be referred to the time of the great Pyramids (Fifth Dynasty); it is now in the Museum of the Royal College of Surgeons in London. Many mummies of the Middle Kingdom (about 2000 B.C.) have been found from time to time; but most of them were so extremely fragile that it was impossible to move them. Several mummies of queens of the Middle Kingdom have recently been found in the course of excavations at Thebes on behalf of the Metropolitan Museum of New York. They are remarkable in many respects, not merely for their exceptionally good preservation and toughness, but also because they were not embalmed in the manner that was customary in Egypt. The organs of the body had not been removed, as was the rule, through an incision in the flank; but some resinous material had been injected into the bowel, and in all probability also applied to the surface of the corpse and its wrappings.

It was not until about 1500 B.C. that the art of embalming had reached so high a pitch of excellence that it became possible to preserve the body with stone-like hardness. One of the factors in the rapid progress of the embalmer's art during the time of the New Empire was the expulsion of the Hyksos kings and the freer intercourse with and conquest of Syria, which enabled the Egyptians to obtain resins, balsams, and aromatic woods in much greater quantities and varieties than before. The recovery, about forty years ago, of the royal mummies of the Eighteenth to the Twenty-second Dynasties, which had been hidden for more than twenty-eight centuries in a cave at Thebes, provided archæologists not only with the actual bodies of some of the most famous kings and queens in the world's history and enabled people of the present day to gaze upon the actual faces of the men and women who dominated the civilized world thirty centuries ago, but also with the accurately dated material for studying the evolution of the embalmer's art during the six centuries of its most significant development. Altogether about fifty of these royal mummies are now in the Cairo Museum, including such famous Pharaohs as Thothmes III, Amenophis III, Seti I, Ramses II, and Menephtah, who, according to an ancient Alexandrian (but probably untrue) legend, was the Pharaoh of the Exodus. Although the mummy of the most romantic of all the royal consorts of Egypt, Queen Tiy's, has never been recovered, those of her parents, Yua and Thua, her husband, Amenophis III, and son, the famous heretic King Akhenaten, have been found. One of the most remarkable phases in the history of the practice of mummification was the devising of measures (at the time of the Twenty-first Dynasty) for restoring the form and features of the body and making it as complete a reproduction of the living body as possible. The complexity and difficulty of the technique inevitably led to many failures, and as a result the art of embalming rapidly deteriorated during the six centuries before the Christian era. Far more attention was then lavished upon the wrappings and the external decoration of the swathed mummy than upon the body itself. Moreover, the introduction of the use of bitumen from Palestine as a preservative represented a further degradation of the art of mummification. With the coming of Christianity to Egypt the practice of embalming was not abandoned, in spite of repeated protests by the early bishops of the Christian Church against the continuance of so heathen a custom. In fact, the custom of preserving the body, by packing it in large quantities of salt, was generally observed throughout Egypt until the seventh century, when the coming of Islam is supposed finally to have destroyed this remarkable custom after more than forty centuries of use. But although it was thus abandoned in the land of its birth, it has been retained in other parts of the world, to which different phases of the Egyptian method have from time to time been transmitted. Early methods of embalming spread south up the Nile to the heart of Africa; later on the methods of the New Empire period, and especially the peculiarly distinctive procedures of the Twenty-first Dynasty, were diffused across equatorial Africa to Nigeria, and to the east to India, Indonesia, Melanesia, and Polynesia, and eventually in a modified form to Peru and Central America. Later methods in late pre-Christian and early Christian times spread far and wide in the Mediterranean area, Europe, and Western Asia.

Mummy-head of Rameses II

Apart from the very positive and precise evidence it affords of the diffusion of ancient culture throughout the world at different epochs, and especially from 900 B.C. onwards, the art of embalming is of general interest from the influence it exerted on the practices and the ritual procedures of most religions, of the part it played in the development of the art and science of medicine, and for its intimate genetic relationship to the development of funerary monuments, from which the crafts of the carpenter and the stone-mason had their origin, as well as the art of architecture.—BIBLIOGRAPHY: G. Elliot Smith, *The Royal Mummies*; *The Migrations of Early Culture*; *The Evolution of the Dragon.*

Mumps, or Epidemic Parotitis, is an acute contagious disease, characterized by an inflammation of the parotid and, to a less extent, the other salivary glands. The disease is spread by direct contact, and is not conveyed through the air for any distance. The incubation period is usually from eighteen to twenty-one days, and the first symptom is a slight fullness of the parotid gland, just in front and below the level of the ear. The swelling increases rapidly, and leads to much enlargement of the cheeks, and there is usually also some swelling of the glands in the neck. Both sides of the face are as a rule affected, and there is considerable pain, most marked when the jaws are moved. Various complications may arise, but the most frequent is pain and swelling of the testicle, known as orchitis, in the male; much less commonly in women there is similar affection of the female genital organs. The disease is most common between five and fifteen years, and not infrequent in early adult life.

Münchhausen (mün*h*ʹhou-zn), Karl Friedrich Hieronymus, Baron von, a German officer, born in Hanover in 1720, died 1797. He was a passionate lover of horses and hounds, of which, and of his adventures among the Turks, he told the most extravagant stories; and his imagination finally so completely got the better of his memory that he really believed his most improbable and impossible fictions. *Baron Münchhausen's Narrative*, a small book of forty-eight pages, appeared in London in 1785. Two years after it was translated into German by Bürger, who naturally passed in Germany for the writer. The real author was Rudolf Erich Raspe (1737–94), a native of Hanover who took refuge in England from a charge of theft. The book was afterwards enlarged by additional stories, many of them very old.

Mungo, a remanufactured fibre, is obtained by submitting milled woollen material, such as cast-off clothing, tailors' cuttings, and the like, to the action of the teeth of a rag-grinding machine, which tears up the felted cloth into shreds. The torn-up material undergoes other treatment before it is ready for spinning, either alone or in conjunction with other waste materials, or new fibres, or both. Seams, buttonholes, linings, &c., which contain cotton threads, are clipped from the cast-off clothing, or else the garments are carbonized (subjected to the action of HCl in liquid or fumes) to burn out the vegetable material. Briefly, mungo is a remanufactured substance obtained from heavily-milled cuttings, whereas shoddy (q.v.) is obtained from loose, unmilled articles.

Mungo, St., or **Kentigern**, the patron saint of Glasgow, an early apostle of the Christian faith in Britain, was the son of Owen, king of Strathclyde, and Princess (St.) Theneu, and was born at Culross about A.D. 514, and brought up by St. Serf, the head of a monastery there, whose favourite pupil he became. His name, Kentigern, was exchanged by the brethren of the monastery for *Mungo*, the beloved, on account of the affection they bore him. On leaving Culross Kentigern founded a monastery on the banks of a small stream flowing into the Clyde, subsequently the site of Glasgow Cathedral. Having some troubles with the king of the Strathclyde Britons, he afterwards took refuge with St. David in Wales, and while in that country he founded a religious establishment under a follower named Asaph, which afterwards became the seat of the bishopric of St. Asaph. He returned to Glasgow, where he acquired a character of great sanctity, and died about 608. Numerous miracles were ascribed to him, and several legendary biographies are preserved.—Cf. A. P. Forbes, *The Historians of Scotland*.

Munich (Ger. *München*), the third largest city of Germany, capital of the Republic of Bavaria, on the Isar, some 1700 feet above sea-level. The new town, extending to the north and west, is essentially modern and imposing, and altogether Munich is one of the most attractive of European cities. The former Royal Palace comprises a series of three buildings, the Alte Residenz (1600–16), the Festsaalbau (1882–42), and the Königsbau (1826–88), the latter an imitation of the Pitti Palace at Florence. Among other buildings are the National Theatre; the Library (1882–42), with over a million volumes and forty thousand MSS.; the university, founded at Ingolstadt (1472), transferred to Landshut (1800), and eventually to Munich (1826); and, among many churches, the building dedicated to St. Peter (1170), but frequently restored. The principal industry is brewing, but rifles, scientific instruments, and technical apparatus are manufactured, and photography, engraving, and the applied arts are in general extensively practised. *Jugend*, *Simplicissimus*, and other famous periodicals are published in Munich, which is the seat of innumerable literary, scientific, and geographical societies and institutions. It is the centre of the South Bavarian Railway system.

Munich was founded by Henry the Lion (1158) on land traditionally the property of the Benedictine monks of Schäftslarn (i.e. *Forum ad Monachos*, whence the name *Munich*). Ludwig the Bavarian rebuilt the city after a fire in 1887, and it was successively under the patronage of Albert V and the Elector Maximilian I, to whom the present museums and palaces are indirectly due. Ludwig I, during his reign, raised the city to pre-eminent rank as a centre of culture in Germany. The city took a great part in the Revolution of Nov., 1918. Pop. (1919), 630,711.

Munkacsy (mụn′kȧch-i), Mihaly, real name *Michael Lieb*, Hungarian genre and historical painter, born at Munkacs 1846, died in 1900. Among his best-known pictures are: *Last Day of a Condemned Man*, *Milton dictating Paradise Lost*, *Christ before Pilate*, and *Last Moments of Mozart*.

Munro, Hugh Andrew Johnstone, classical scholar, was born at Elgin in 1819, died at Rome in 1885. He was educated at Shrewsbury School and at Trinity College, Cambridge, graduating in 1842 as second classic and first chancellor's medallist. In 1843 he was elected a Fellow of his college, where later he became lecturer in classics. From 1869 to 1872 he was Kennedy professor of Latin in his university. His most notable contribution to scholarship was his great edition of Lucretius, of which he published a text, with critical introduction, in 1860, and an improved text, with a commentary and translation, in 1864 (2 vols.). This work, of which the fourth and final edition in 3 vols. appeared in 1886, forms a landmark in the history of English classical scholarship during the last century. Other works of his include: *The Pronunciation of Latin*, a pamphlet (1871); *Criticisms and Elucidations of Catullus* (1878); and *Translations into Latin and Greek Verse*.

Munster, the southernmost and largest of the four provinces of Ireland (q.v.), comprising the six counties of Clare, Cork, Kerry, Limerick, Tipperary, and Waterford. It is mountainous. The principal rivers are the Shannon, Bandon, Blackwater, Lee, and Suir. At the time of the English conquest Munster, one of the old Irish kingdoms, was divided into two principalities, viz. Desmond in the south and Thomond in the north. During the reign of Elizabeth it was divided into counties. Area, 9522 sq. miles; pop. (1911), 1,035,495.

Münster, a town of Westphalia, Germany, on the Aa and Dortmund-Ems Canal. There is a thirteenth-century cathedral, the churches of St. Lambert and Our Lady, erected during the fourteenth century, and an ancient monastery. Administrative offices are accommodated in the ancient castle of the prince-bishops; the university, founded in 1786 and suppressed in 1818, was reorganized in 1902, with faculties of theology, philosophy, and law. Among manufactures are linen and cotton textiles, leathers, beer, Westphalian hams, and paper goods. Münster is first mentioned as the seat of a Saxon bishopric founded by Charlemagne about A.D. 805, and within it was subsequently established by John of Leyden, leader of the Anabaptists, 'the Kingdom of the New Zion', which came to an end in 1535. The bishops were made princes of the empire in the twelfth century. Their lands (2500 sq. miles) were secularized in 1803, and apportioned among Hanover, Prussia, and Brandenburg. Pop. (1919), 100,452.

Muntjac, a small species of deer, the *Cervŭlus muntjac*, found in British India, the Malay Peninsula, Sumatra, Java, and Borneo, about 26 inches high at the shoulder. They are of solitary habits; the male has short horns, and they use their teeth effectually in self-defence.

Muntz's Metal (from G. F. Muntz of Birmingham, the inventor), an alloy of 60 parts copper and 40 parts zinc, used for the construction of bolts, nuts, pump plungers, &c., which come into contact with sea water. It possesses considerable strength and the capacity of being forged.

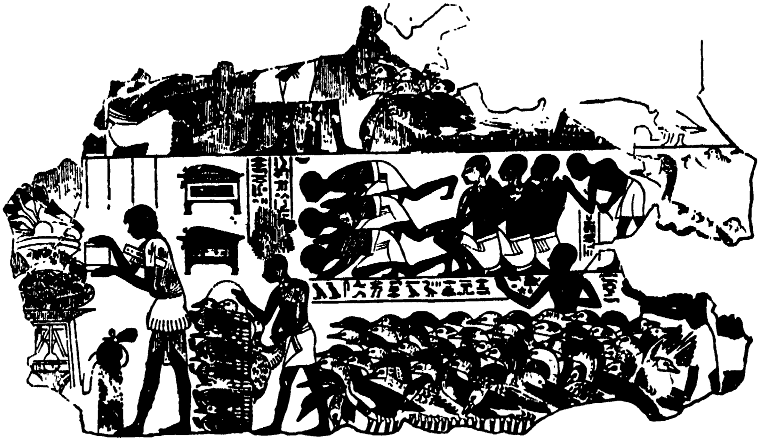
Münzer (mủnt′sėr), Thomas, a German fanatic, born about 1490, executed 1525. He held a mystical belief in continuous divine revelation through dreams and visions, and promulgated the doctrine of community of goods. He collected a large number of peasant followers, who committed many outrages, but in 1525 were totally defeated, when Münzer was taken and executed.

Murad V, Sultan of Turkey, born 1840, died in 1904. Son of Abdul-Medjid, he succeeded to the throne on the forcible deposition of Abdul Aziz in 1876, but was deposed in the course of the same year on account of insanity, and was succeeded by his younger brother, Abdul Hamid.

Muræ′na, a genus of soft-finned fishes, type of the family Murænidæ, closely related to that including ordinary eels. They have no pectoral fins, and the dorsal and anal fins are very low and are united. The *M. helena*, or murry, is found in the Mediterranean; it grows to the length of between 4 and 5 feet, and even more, and is excellent eating.

Mural Circle, an astronomical instrument consisting of a telescope attached to a vertical brass circle which turns upon an axis passing through a stone pier. The brass circle revolves exactly in the plane of the meridian, and is carefully divided into degrees and smaller angular units. Attached to the stone pier, and at equal distances apart, are six microscopes for the purpose of viewing the graduated circle and determining exactly its position and consequently that of the telescope. This was formerly a principal instrument in observatories, but is now practically superseded by the transit circle. Its chief use is to measure angular distances in the meridian, and so to determine the declination of a star, or its distance from the celestial equator. The right ascension of a star being given by the transit instrument (q.v.), and its declination by this, its exact position is determined.

Mural Decoration. The earliest mural paintings were those executed in Egypt, about 4000 B.C., in some form of tempera on a thin stucco of lime upon brick. Figure subjects, generally arranged in horizontal bands and treated in profile, were the rule. The representation of animals was tolerably naturalistic, but human beings were conventionalized in form and colour. The influence of Egyptian painting seems to have spread throughout Mesopotamia and to Crete, where mural painting was extensively practised, as recent excavations at Knossos show. Thence it passed to Greece, where progress was rapid and continuous from the archaisms of the sixth to the achievements of the fourth century B.C. No examples survive; but contemporary descriptions and the paintings on vases show that in the earlier periods figures were represented in one plane without landscape, while, later, space was suggested by various means. A celebrated early work was the *Battle of Marathon*, painted 450 B.C. by Polygnotus and Micon. Among their successors, Apelles and Zeuxis were the most famous. Of Roman mural painting our knowledge is for the greater part derived from late Pompeian and Roman work, which is mainly by workmen who produced versions of Greek originals. On walls coloured deep red, black, or yellow were placed panels of figure subjects (usually taken from mythology), still-life, or conventional ornament, painted in tempera on stucco, with a plain dado below and an ornamental frieze above. In the Christian era mosaic for a time largely replaced mural painting. Such painting as there was followed the stiff conventional style of the mosaics, until the freer, more naturalistic school of the thirteenth century developed. Prominent in this are Cimabue, his greater pupil Giotto, and Duccio of Siena. They and their contemporaries worked either in *fresco a secco* (dry fresco) or in *buon' fresco*, in which the artist paints on the plaster while still wet (see *Fresco*), and were chiefly employed in the decoration of churches, whose architectural style of extensive wall-spaces and small window-openings was peculiarly suitable for mural painting. Examples of their work may be seen in Florence, Assisi, Padua, Siena, and Perugia. A century later this Gothic style of mural painting was superseded by that of the Renaissance, of which the earliest complete expressions are the frescoes by Masaccio in the Church of the Carmine, Florence; and whose greatest achievements include the Sixtine Chapel at Rome by Michelangelo, and the Stanze and Loggie of the Vatican by Raphael. *Buon' fresco* now becomes the almost invariable medium.



Egyptian Wall-painting from the tomb at Thebes, about 1580–1350 B.C.; now in British Museum
The painting depicts the counting and inspection of geese on a farm.

During the fifteenth and sixteenth centuries elaborate mural paintings were also carried out in public buildings and the palaces of the nobility, notable examples being the work of Mantegna at Mantua, Cosimo Rossalli at Florence, Pinturicchio at Siena, and of Titian, Tintoretto, and Paul Veronese in Venice. Since the development of painting in oil in the sixteenth century the medium chiefly used for mural painting has come to be oil on canvas, wax being mixed with the oil to give a non-shiny surface. The canvas is then attached to the wall, usually by a *marouflage* of white lead, oil, and copal varnish. This method is particularly suitable for cool and damp climates; but if the painting is to last, additional precautions, such as damp-proof courses and double walls, are advisable. Since the seventeenth century France has been the chief centre of mural decoration. In Holland the absence of a court, a nobility, and the Roman Catholic Church limited the demand for big decorative canvases to that of the guilds and civic bodies; in England the extensive use of panelling and tapestry in interior decoration checked the development of mural painting. In France there succeeded to the group of artists employed by Francis I to decorate his castle at Fontainebleau, the group employed by Louis XIV at Versailles, the Louvre, Marly, and other residences, of which Charles Le Brun was the leading figure. This in turn was followed by the eighteenth-century decorators, such as François Boucher and J. B. Oudry, whose work is less imposing and grandiose, but better adapted to the smaller rooms which were becoming the rule. In the nineteenth century little mural painting of genuine distinction was produced. The most important work is that of Puvis de Chavannes, who is represented at the Sorbonne and the Hôtel de Ville in Paris, and at Amiens, by work of great dignity and refinement. Among contemporary mural painters, Albert Besnard in France, and Frank Brangwyn in England, occupy a leading place. See *Mosaic*; *Tapestry*.—BIBLIOGRAPHY: A. P. Laurie, *Materials of the Painter's*

Craft; J. Ward, *History of Mural Decoration*; H. J. Westlake, *History of Mural Decoration.*

Murat (mü-rä), Joachim, French marshal, and for some time King of Italy, the son of an innkeeper at Cahors, born in 1771, died 1815. He served in the constitutional guard of Louis XVI; then entered the 12th Regiment of mounted chasseurs; rose by his zealous Jacobinism to the rank of lieutenant-colonel; was afterwards removed as a terrorist, and remained without employment till his fate placed him in connection with Bonaparte, whom he followed to Italy and Egypt, becoming general of division in 1799. In 1800 he married Caroline, the youngest sister of Bonaparte. He was present at the battle of Marengo, and in 1804 was made marshal of the empire, grand-admiral, and prince of the imperial House. His services in the campaign of 1805 against Austria, in which he entered Vienna at the head of the army, were rewarded in 1806 with the Grand-Duchy of Cleves and Berg. In the war of 1806 with Prussia, and of 1807 with Russia, he commanded the cavalry, and in 1808 he commanded the French army which occupied Madrid. He anticipated receiving the crown of Spain, Charles IV having invested him with royal authority; but Napoleon, who destined Spain for his brother Joseph, placed him on the throne of Naples, 15th July, 1808. Murat then took the title of *Joachim Napoleon.* He shared the reverses of the Russian campaign of 1812, and in 1813 again fought for Napoleon, whose cause he deserted after the battle of Leipzig. He took up arms again in 1815 for Napoleon; but being defeated by Generals Neipperg and Bianchi near Tolentino, 2nd and 3rd May, he was forced to leave Italy, and took refuge in Toulon. After the overthrow of Napoleon he escaped to Corsica, and set sail for the Neapolitan territory with a view to recover his kingdom. He landed at Pizzo on 8th Oct., but was immediately captured, tried by a court-martial, and shot.—Cf. A. H. Atteridge, *Joachim Murat.*

Murato′ri, Ludovico Antonio, Italian historian, born 1672, died 1750. He was successively librarian at Milan and ducal archivist and librarian at Modena. He made many valuable contributions to Italian history, notably *Rerum Italicarum Scriptores ab Anno 500 ad 1500* (27 vols. folio, 1723–51), *Antiquitates Italicæ Medii Ævi* (6 vols., 1738–42), and *Annali d'Italia.*

Murchison (mėr′chi-sun), Sir Roderick Impey, Scottish geologist, born at Tarradale, in Ross-shire, 1792, died 1871. He studied at the military college, Great Marlow, and at Edinburgh University; joined the army, and served in the Peninsular War (1807–8). Murchison was one of the most prominent geologists of his time. In 1831–2, and again in 1842–3, he was elected president of the Geological Society. He was a founder and an active member of the British Association for the Advancement of Science, and he presided over the meeting of that association at Southampton in 1846. In 1855 he was appointed director of the Geological Survey and of the Royal School of Mines. He was several times elected president of the Royal Geographical Society. Among his works are *Siluria* and *The Geology of Russia.*

Murcia, a maritime province of South-Eastern Spain, on the Mediterranean, traversed towards the north-west by the Sierra de Espuña, but elsewhere comparatively flat. It is well watered (Segura and tributaries); the climate is hot and dry; oranges, maize, vines, and cereals are produced, and the mulberry tree is tended for silk-worm breeding. Zinc, lead, and sulphur are worked. The capital is Murcia; Cartagena is the port. The modern provinces of Murcia and Albacete correspond with the ancient Moorish Kingdom of Murcia (1224–43), which followed the Carthaginian and Roman settlements. It was taken by Castile in 1240. Area, 4453 sq. miles; pop. (1920), 632,000.

Murcia (Ar. *Medînât Mursiya*), the sixth city of Spain, capital of the province of Murcia, on the Segura River (ancient *Tader*; Ar. *Sázhura*), 50 miles by rail north-north-west of Cartagena. The cathedral of Santa Maria (founded in 1358 on the site of a mosque) possesses a tower 480 feet high (1522–1766). Trade is mainly in fruit. After the fall of the Caliphate of Cordova the town was capital of the Kingdom of Murcia, and was taken (1243) by Ferdinand of Castile.

Murder, the act of unlawfully killing a human being with premeditated malice, the person committing the act being of sound mind and discretion, and the victim dying within a year and a day after the cause of death administered. In Britain it is the law that every person convicted of murder shall suffer death as a felon. In the United States of America the law recognizes degrees in murder, and in France and some other nations 'extenuating circumstances' are recognized. See *Capital Punishment*; *Criminality*; *Homicide.*

Murex, a genus of sea-snails resembling the whelk; shell spiral, rough, with three or more rows of spines simple or branched. Murices are remarkable for the beauty and variety of their spines. They were in high esteem from the earliest ages on account of the purple dye that some of them yielded.

Murger (mür-zhăr), Henri, born at Paris 1822, died 1861. He lived a life of extreme privation; formed an informal club or society of unconventional young artists and authors similarly situated, which was named 'Bohemia', and the associates 'Bohemians'—a name famous in general literary history. He made a reputation by his *Scènes de la vie de Bohême*, which is the source of Puccini's famous opera *La Bohême* (1898). He also published two volumes of poetry, *Ballades et fantaisies* and *Les Nuits d'hiver*; and wrote dramas for the Luxembourg theatre, and tales, &c., for the *Revue des Deux Mondes*.

Murghab, a river of Asia, which rises in the mountains of Northern Afghanistan, and after a course of 400 miles loses itself in the sands surrounding the oasis of Merv.

Murillo (mu-rēl′yō), Bartolome Esteban, Spanish painter, born at Seville 1618, died there 1682. He first studied under Juan del Castillo, and visited Madrid in 1641, where he worked in the Royal Picture Gallery and was befriended by Velasquez. On his return to Seville in 1645 he painted a group of pictures for the convent of S. Francesco, these being in his first or cold (*frio*) manner, with firm outline and strong chiaroscuro derived from Ribera and Caravaggio. One of these, the *S. Diego*, is in the Louvre. In 1648 he married a lady of fortune, which, combined with many commissions, enabled him to found the Academy of Seville, of which he became joint president with Herrera. To 1648 belongs his *Flight into Egypt*, after which he adopted his second or warm (*calido*) style, in which are painted *S. Isidoro* and *S. Leandro*, both in Seville Cathedral; the *Dream of Pope Liberius*, at Madrid; and the *Immaculate Conception*, in the Louvre. He then adopted a third, or *sfumato* (smoky) manner, an unsuccessful compromise between the strong chiaroscuro used by most of his contemporaries and the pattern in colour used by earlier painters. In this last style are *The Charity of S. Juan de Dios*, at Seville; the *Holy Family*, in the National Gallery; and a group of pictures in the Wallace Collection. In early life he painted many pictures of beggars and working-class life, strongly realistic in treatment, examples of which are in the Dulwich Gallery. Later in life he concentrated on large religious pictures, into which he introduced idealized and sentimental types. He was also a competent portrait-painter.

Murman, a name applied to the Kola Peninsula (North Russia), but properly applicable to the coast only, extending between the White Sea and Kola Bay. It is the only ice-free coast of European Russia north of the Crimea. Murmansk, on Kola Bay, was founded in 1915, and is the terminus of the Arctic Railway. In February-March, 1918 (European War), an Allied army was sent to Murmansk to protect the 'Eastern Front' after the breakdown of Russia, and to avoid encroachment by the pro-German state of Finland, who had arranged with the Bolsheviki to extend their territory in this direction. In June, 1918, British, French, and American troops occupied Murmansk, Alexandrovsk, the Russian end of the cable from Peterhead, Scotland, and adjacent territory. The Murman Soviet supported the Allies throughout, and on 11th April the Bolsheviki were defeated at Urosozero, and the Allies advanced to the shores of Lake Onega, where a British expedition captured two lake steamers and took the port of Talvuiski (2nd Aug.). During September a rapid Allied advance was made on Petrozavodsk, the Bolshevik base, but, Germany having collapsed, the need for Allied military action in Russia had disappeared, and troops were operating in North Russia without any clearly defined policy. Hence, at the end of 1919, Murmansk was evacuated.

Murom, a town of Russia, in the government of Vladimir, on the Oka, and served by the Kovrov-Murom Railway. Murom was of commercial importance as early as the tenth century. Pop. 19,000.

Murray, Sir James Augustus Henry, philologist and lexicographer, was born near Hawick, Roxburghshire, in 1837, died 1915. He was educated at Minto and Edinburgh, and graduated B.A. of London University. After acting as schoolmaster in Hawick, he became master at Mill Hill School, near London, in 1870, remaining there till his removal to Oxford in 1885. He was knighted in 1908. From 1879 until his death Sir James Murray was editor of the *New English Dictionary on Historical Principles*, the great work which has been issued from the Clarendon Press. His writings include: *Dialect of the Southern Counties of Scotland* (1873), and the article *English Language* in the *Encyclopædia Britannica* (9th edition).

Murray, John, the name of a firm of eminent London publishers. It was established by John MacMurray in 1768. John Murray (1778–1843) began business when quite young, early attained success, and became the friend of as well as publisher for some of the chief writers of the day, including Byron, Moore, Rogers, Campbell, Crabbe, Washington Irving, &c. He started the *Quarterly Review* in 1809. The well-known *Handbooks for Travellers* were originated by his son.

Murray, Sir John, biologist and oceanographer, born at Coburg, Ontario, in 1841, died 1914. He was chief naturalist to and edited the scientific reports of the *Challenger* Expedition (1872–6), and carried on special research work in the Clyde area between 1892 and 1894, establishing a marine biological station at Millport. He carried out a bathymetrical survey of the freshwater lochs of Scotland.

Murray, Lindley, grammarian, born in Pennsylvania, of Quaker parents, in 1745, died 1826. About the age of twenty-one he was called to the Bar, and acquired an extensive practice. In 1784 he went to England, and passed the remainder of his life near York. He wrote an *English Grammar* (1795), which was the standard grammar for about fifty years.

Murray, the largest river in Australia, rises in the Australian Alps about 36° 40′ s. and 147° E., its sources being partly in New South Wales, partly in Victoria; flows westward, forming the boundary between the two colonies for 1200 miles; then passes into South Australia, and falls into the sea through a large shallow sheet of water called Lake Alexandrina. It is navigable as far as Albury; length, about 1250 miles. Its chief tributaries are the Murrumbidgee, the Darling, and the Lachlan on the right bank, and the Goulburn, Campaspe, and Loddon on the left. The whole system has been extensively manipulated by the Australian Government for irrigation and hydro-electric purposes.

Murrumbid′gee, a river of New South Wales, rising in the Australian Alps, and entering the Murray after a westward course of about 1300 miles; chief tributary, the Lachlan.

Murshidabad′, a city of India, Bengal, capital of a district of the same name, on the Bhagirathi. It was the capital of Bengal till 1772. The Nawab Bahadur of Murshidabad is the premier noble of Bengal. The industries include the embroidery of fancy articles with gold and silver lace, ivory carving, and the making of musical instruments. Pop. 12,000. — The district of Murshidabad has an area of 2144 sq. miles, and a pop. of 1,370,000.

Murzuq, the chief town of Fezzan, in the hinterland of Italian Libya. It was founded in 1310, and is an important oasis on the caravan route from Tripolitania to the Western Sudan. Pop. about 4000.

Musa′ceæ, a natural order of monocotyledons, of which Musa is the typical genus. It includes the abaca or manilla hemp, the banana, and the plantain.

Musæ′us, a legendary Greek poet, said by some to be the son of Eumolpus and Selēnē; by others, of Linus or Orpheus. He is credited with the mystic and oracular verses of the Eleusinian and other mysteries. The ancients attribute to him many works, of which some verses only have come down to us as quotations in Pausanias, Plato, Aristotle, &c. A later Musæus, who probably lived four or five centuries after Christ, is the author of a poem entitled *Hero and Leander*, discovered in the thirteenth century and published in 1404 by Aldus Manutius. It was paraphrased by Marlowe.

Musäus (mṳ-zā′ṳs), Johann Karl August, German author, born 1735, died 1787. Among his writings are: *Der Deutsche Grandison*, *Volksmärchen der Deutschen*, and a series of tales under the title *Straussfedern* (Ostrich feathers).

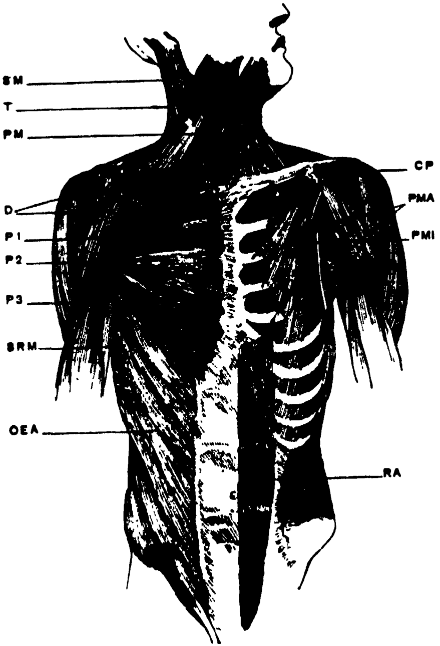
Musca, a genus of two-winged insects, including the common house-fly (*M. domestica*). It is the type of a family (Muscidæ).

Muscat, the chief city of Omán, or Muscat, South-Eastern Arabia, a seaport on the Indian Ocean (Gulf of Omán). The town is one of the hottest places in the world. It is an important centre of trade, exporting pearls, mother-of-pearl, dye-stuffs, drugs, dates, and coffee, and importing rice, sugar, and piece-goods. Muscat was occupied by the Portuguese in 1508, and became the capital of a native Sultanate in 1741. British troops occupied Muscat in 1915 on behalf of the Sultan (apart from the European War), and a British Political Agent and Consul has now his head-quarters there. Pop. 26,000.

Muschelkalk (mṳsh′el-kálk), a compact hard limestone of a greyish colour found in Germany. It is interposed between the Bunter sandstone, on which it rests, and the Keuper variegated marls, which lie over it, and with which at the junction it alternates, thus forming the middle member of the Triassic system as it occurs in Germany. In England the Keuper type of strata rests immediately on the Bunter. It abounds in marine organic remains, its chief fossils being encrinites, the ammonite ceratites, and bivalve molluscs. Its palæontological importance was greatly reduced by the exploration of the extensive series of marine Triassic deposits in the Eastern Alps.

Mus′cidæ, a family of two-winged flies, of which the common house-fly (*Musca domestica*) is a familiar example. Here also belong the blue-bottles (flesh flies) and green-bottles; also, among biting forms, stable-flies (Stomoxys) and tsetse-flies (Glossina).

Muscle and Muscular Motion. The name *muscle* is applied to those structural elements or organs in animals which are devoted to the production of movements, either of a part of the body or of the body as a whole. They consist of fibres or bundles of fibres, susceptible of contraction and relaxation, enclosed in a thin cellular membrane. Muscles are composed of fleshy and tendinous fibres, occasionally intermixed, but the tendinous fibres generally prevail at the extremities of the muscle, and the fleshy ones in the belly or middle part of it. When the fibres of a muscle are placed parallel to each other, it is called a *simple* or *rectilinear* muscle; when they intersect and cross each other, they are called *compound*. Muscles are divided into *voluntary* and *involuntary*, the former being those whose movements proceed from an immediate exertion of the will, as in raising or depressing the arm, bending the knee, moving the tongue, &c., while the latter are beyond this control, being the agents in the contraction of the heart, arteries, veins, stomach, intestines, bladder, womb, &c. When examined under the microscope, the fibres of the voluntary muscles (as also those of the heart) are seen to be marked by minute transverse bars or stripes, while those of the involuntary are smooth and regular in appearance. The former is therefore called *striped* or *striated* muscle, the latter *unstriped*, *nonstriated*, or *smooth* muscle. The great property of muscular tissue is the power of responding when irritated. The response is in the form of contraction, that is, when the muscle is irritated or stimulated it responds by shortening itself, so that its ends are brought nearer and it becomes thicker in the middle, its inherent elasticity making it capable of returning to its previous length when the stimulation is withdrawn. By these contractions the muscles are able to do work. Stimulation is by nervous action (see *Nervous System*), but mechanical means, such as pinching, pricking, &c., electricity, heat, and chemicals also cause irritation. All the muscles are connected with bones not directly but through the medium of tendons. A tendon presents the appearance of a white glistening cord, sometimes flat, but often cylindrical and of considerable thickness. The mass of flesh composing the muscle is called the *belly* of the muscle. One end is usually attached to a bone more or less fixed, and is called the *origin* of the muscle. The other end is attached to the bone meant to be moved by the contraction of the muscle, and is called the *insertion* of the muscle. Involuntary muscle consists of spindle-shaped cells having an elongated nucleus in the centre. They are united in ribbon-shaped bands, and respond much less rapidly than the voluntary to irritations, and the wave of contraction passes over them more slowly. There are several hundreds of separate muscles in the human body, and they are broadly grouped into muscles of the head, face, and neck; muscles of the back; muscles of the chest; muscles of the upper extremity, the shoulder, arm, forearm, and hand; muscles of the abdomen; and muscles of the lower extremity, the thigh, leg, and foot.



Muscles of the Chest and Abdomen

SM, Sterno-mastoid. T, Trapezius. PM, Platysma myoides. D, Deltoid. P1, P2, P3, Clavicular, Costosternal, and Abdominal parts of Pectoralis major. SRM, Serratus magnus. OEA, Obliquus externus abdominis. RA, Rectus abdominis. PMI, Pectoralis minor. CP, Coracoid process. PMA, Pectoralis major (cut).

Muses (Gr. *Mousa*), in the Greek mythology, the daughters of Zeus and Mnemosynē, who were, according to the earliest writers, the inspiring goddesses of song, and according to later ideas divinities presiding over the different kinds of poetry, and over the sciences and arts. Their original number appears to have been three, but afterwards they are always spoken of as nine in number, viz. *Clio*, the muse of history; *Euterpē*, the muse of lyric poetry; *Thalīa*, the muse of comedy, and of merry or idyllic poetry; *Melpomĕnē*, the muse of tragedy; *Terpsichŏrē*, the muse of choral dance and song; *Erăto*, the muse of erotic poetry and mimicry; *Polymnia* or *Polyhymnia*, the muse of the sublime hymn; *Urania*, the muse of astronomy; and *Calliŏpē*, the muse of epic poetry.

Muse'um. See *British Museum*; *Kensington (South) Museum*; *Paris*. Other references are given in the index.

Mushrooms, the common name of numerous Fungi. Some of them are edible, others poisonous. The species of mushroom usually cultivated is the *Agaricus campestris*, or eatable agaric, well known for its excellence as an ingredient in sauces, especially ketchup. (See *Agaric*.) Mushrooms are found in all parts of the world, and are usually of very rapid growth. In some cases they form a staple article of food. In Tierra del Fuego the natives live almost entirely on a mushroom-like Ascomycete, *Cyttaria Darwinii*; in Australia many species of Bolētus are used by the natives, and the *Mylitta austrālis* is commonly called native bread. *Mushroom spawn* is a term applied to the mycelium of the mushroom.

Music. *History.*—It is not customary outside the ranks of serious musicians to regard music as a science, but it is one nevertheless, and the history of music is simply a record of man's study of sound as he found it in nature, his gradual understanding of its physical properties, and its possibilities for artistic pleasure, and finally his slow discovery of the appropriate conditions under which these possibilities could be most completely realized. Music, therefore, is not only one of the most uplifting of human pleasures but also one of man's greatest intellectual triumphs. References to music are found among the earliest literary records, and at no period of which anything is known does the world seem to have been without it. It is therefore remarkable that music, as we know it today, is the growth and development of only a few centuries. It is the infant among the arts, younger than painting, and very much younger than literature and sculpture.

Of the nature of the music practised by the ancient civilized nations not much is known, but it would seem to be the case that the Egyptians were the most advanced musically in the earliest days of civilization, and that in their solemn religious ceremonies in particular music played an important part. We gather from the bas-reliefs of ancient Egypt that harps of many kinds, flutes, tambourines, trumpets, and other instruments, were in constant use, and that they were often combined into small orchestras; and the suggestion has been made that these combinations of musicians and of instruments argue the possession of a well developed art, which, with so much else relating to the early times of the world, has been lost beyond recovery. While the point is not open to proof or disproof, the probability is that the music enjoyed by the Egyptians of early times did not attain to such a degree of expressiveness as would come near to satisfying the modern music-lover.

It is practically certain that the Egyptians brought the beginnings of their musical system from Ethiopia, the country of their origin, and in due time developed it to a considerable degree. The Children of Israel during their sojourn in Egypt would receive into the ready soil of their genuinely musical nature many seeds which they afterwards cultivated so assiduously as to become the most finely developed, musically, of all the ancient nations. The Greeks also borrowed their musical ideas from the same source, and these two peoples form the link between the music of the ancient world and that of to-day. The influence of the Hebrews has been exerted only in a general way, but the Greeks played a very direct part in laying the foundations of modern music. This they did through the agency of the Romans, who had adopted the Greek system of scales, which in the first centuries of the Christian era exerted a controlling influence on the music of the early Church. During the decline of the Roman Empire, music, like the other arts, suffered greatly, and almost no progress was made. Indeed what little had been achieved was seriously threatened by the materialistic tendencies of the time. It was at this period (towards the end of the fourth century) that Ambrose, by authorizing for Church use four of the Greek scales and a few traditional melodies, laid the sub-structure on which all subsequent music has been built. His achievements were sufficiently satisfying to hold good for about 200 years, and were capable of producing music of sufficient eloquence to bring about the conversion of St. Augustine. A further extension of the musical system was introduced by Pope Gregory the Great, who derived four additional scales from those already in use, and introduced some new Church melodies. The music of the Church was now much less indefinite than it had been as regards time values of the notes, and derived the name *cantus planus*, or plain chant, from the regularity of its movement.

By about the end of the ninth century musicians were coming to realize that music had grown too elaborate for the very imperfect notation of the time. This consisted of variously shaped signs called *neumes*, which were only of value as an aid to memory for those who knew their music by heart. By the introduction of first one horizontal line and then others, the actual pitch of more and more notes was definitely shown, and from this gradually developed the five-line stave as we know it. Necessity also brought about the invention by Franco of Cologne of a set of signs to represent notes of the various time values. These derived their shape from the early neumes, and were in their turn modified till they finally assumed the form of the notes in our modern notation. Music after many centuries of patient waiting was now ready to advance, having found at last that essential thing without which progress was impossible, namely, the power to record musical thoughts on paper, so that all musicians could recreate them exactly. (It is just the absence of any sign of definite schemes of notation, in connection with the music of the early races, which makes it difficult to believe that they had any highly developed art.) The first step in advance had been taken in the early Middle Ages, when musicians introduced organum or diaphony, which was the first form of harmony. It consisted of parallel versions of the plain song, sung with it at distances of a fourth or fifth, and would sound crude enough to modern ears. A slight improvement was made musically when the transition was gradually brought about from diaphony to descant. This newer and freer style of writing may have arisen in part from the attempts of singers to improvise embroideries to the bald successions of fourths or fifths, and so vary the monotony which as performers they would no doubt strongly feel, though there were not wanting men of insight here and there who boldly advanced the claims of thirds and sixths to be admitted into the company of accepted musical intervals. Later on, musicians grew bolder still, and devised what were called motets. These were the first attempts at an elaborate musical texture, but the method adopted was rather ingenuous. It consisted of the singing of several tunes at once just as they were, excepting that some slight modifications were generally made when the results were too distressing. It is easy for us of to-day to smile at the crudity of these early attempts at music-making, but an endeavour should be made to place ourselves in the musical world of that time. We would then realize that these attempts were prompted by just such a high curiosity and pioneer daring as actuated Columbus when he set out to sail round the world.

The definite advance of music, after the long period of 'marking time', began in Paris in the twelfth century, where, however, little was achieved, probably owing to the unsettled state of the time. About two centuries later England was the leading country in music, and John Dunstable, her leading musician, was regarded as the greatest composer in Europe. Later the supremacy passed to the Netherlands, which held it for a century and a half. Finally it passed to Italy, which witnessed in the wonderful output of Palestrina and many others of several nationalities and almost equal genius the culmination of the great choral epoch. This was in the latter half of the sixteenth century. Palestrina dying in 1594.

In the same year the first opera was produced in Florence. This was the outcome of an attempt on the part of some members of the Florentine nobility, in association with musical enthusiasts, mainly amateur, to revive the style of performance of the ancient Greek dramas. They did not succeed in doing so, but instead achieved something very much greater, something which may fairly be called a musical revolution. Their desire was to find if possible some means of writing music for solo voice with instrumental accompaniment which should be truly dramatic, and not formal in the idiom of the contrapuntal school of composition. Their early attempts were not anything more than varyingly successful examples of recitative, but they laid the foundations of modern music. They liberated musicians from the all-powerful domination of the great choral epoch by turning their thoughts towards free and direct expression of human aspirations and emotions. This effort towards naturalness in musical expression affected also the sphere of sacred music, and gave rise to oratorio, which, born at the same time and from the same source as opera, has had a very similar story of development. The new technical requirements of composers included a greater definition of musical phrases, and a more regularly balanced sequence of phrase lengths than had been necessary under the choral dispensation, and in their search for these requirements the Florentine pioneers received invaluable aid from folk-music. The music of the people had been going its own way during the centuries, and had developed to excellent purpose. Free from the restraining influences that surrounded the music of the schools, it knew no laws but those dictated by the instinctive aspirations of its devotees, and under this inspiring guidance had chosen from among the various modes in general use one for special cultivation. The mode so honoured corresponded to our major scale, and the significance of the choice lay in this, that of all the modes it was the one most essential for the era of harmonic development, which was just about to displace the era of counterpoint. Further, folk-music was either music for folk-dances or was directly descended from it, and in the second case it retained all the elements of rhythmic balance and regularity which are so essential in all dance music. The pioneers of the 'Nuove Musiche', as it was called, were therefore very well served indeed by folk-music, and under its steadying influence their somewhat wandering attempts at composition gradually gained definition. This period marks the beginning of modern music, which is therefore directly founded on the music of the people.

From this point onwards the evolution of music made steady progress, and it is possible for the student to trace every step of the way which leads from the folk-dances and folk-songs of the sixteenth century to the symphonic poems of to-day. Some features of this long development will be dealt with in the succeeding sections of this article. For a detailed account recourse must be had to the various standard histories of music.

Theory of Music.—Throughout the history of music theory and practice have been continually at variance. Every great composer has broken the rules which held good in his time, and theory, after a period of vexation and even anger, has toiled panting after to explain it all. The regularity with which this has occurred has given rise to a false idea regarding musical theory which is very wide-spread, namely, that the study of it tends to cramp and sometimes entirely destroys the artistic individuality of the student. A little reading of musical history would dispel this idea, and show the astonished reader that the great composers were almost without exception hard-working students in this very sphere, and gained from their theoretical studies a confirming and strengthening of their whole musical nature. There is no doubt that the subject has been on the whole badly taught in the past, but the tendency nowadays is towards an increasing use of enlightened methods, which, while teaching the facts of theory, relate them immediately and always to practice.

The student of the rudiments of music is not perhaps in a position to benefit greatly from modern methods of teaching. His subject, with all its intricacies and ramifications, is only the elaborate alphabet of music, and the study of it resolves itself into the acquiring of a definite number of hard facts. The study of harmony and counterpoint is on a different plane, for actual music-making is here, or should be, the goal of all endeavour. In recent times this is becoming increasingly realized, and the days of exclusive concentration on the working of 'figured-basses' are now over. The modern teacher of counterpoint is also shaking off the pedantry which had encrusted the study of this valuable branch of musical knowledge, and is founding his practice more and more, not on the laws of the pedagogues, but on the music of Palestrina, the acknowledged head of the contrapuntal school. The study of form in music, which has for its object the understanding of the principles of structure as applied to composition, has also been too exclusively concerned in the past with the letter of the law, but the extension of the boundaries of musical form which is always going on has compelled in recent times a little more attention to the spirit, since only by this means could the latest developments be duly accounted for. In all departments of theoretical study the proper training of the listening faculty, or what is more commonly known as 'the ear', is at last being seriously and systematically undertaken, and the power to read music at sight is also being generally cultivated. It is on these two points that theoretical study of music should have been based from the beginning, but the increasing recognition of their vital importance is one of the most hopeful signs for the future.

Choral Music.—It was natural that choral composition should be the first branch of the art to reach maturity. Music as a consciously cultivated thing was in the hands of the Church till almost the close of the sixteenth century, and the voice was the only instrument for music-making that man found ready to his hand. These two facts in combination brought about the great choral era, the early stages of which have been briefly referred to in the opening section of this article. From the periods of organum and descant progress had been slow but uninterrupted, and about the beginning of the fifteenth century a considerable degree of smoothness of style had been attained by the best composers. The compositions of those days were entirely contrapuntal in their texture, that is, they were wrought by the simultaneous sounding of three or more melodious parts, and the point of view of the composer was entirely horizontal. This was a legitimate development from the time when musicians harnessed together a number of actual melodies without any regard for their powers of mutual agreement, and forced them to run abreast, calling the cacophony which resulted a motet. In the development of this early idea composers contented themselves with selecting one melody only as a basis for their compositions. This they allotted to one of the sections of the choir, generally tenor, expressing it in equal notes of long time-value, and while the tenor 'held on' (hence the name) to the long notes of this *cantus firmus*, the other sections of the choir decorated it, both above and below, with melodious embroideries, under the controlling guidance of certain laws of progression. To relate these embroideries to each other by means of imitation, so imparting a family likeness to all of the accompanying parts, was a natural and worthy development of the power to make them graceful and flowing. Unfortunately the joy of devising imitative phrases soon took complete possession of the minds of composers, and dexterity in the manipulation of musical themes was cultivated for its own sake, particularly in the form of *canons*, which in time reached an absurd degree of complexity at the cost of all that makes music a great art. At the close of this period of arid cleverness music came for the first time into its kingdom, and within a century of that misguided period had found the power to express through the medium of unaccompanied choral music some of the highest and most beautiful thoughts of man. Among the great names associated with this first climax in musical evolution are: Josquin des Près (born about 1450), Orlando di Lasso (1520–94), Palestrina (1525?–94), and Orlando Gibbons (1583–1625).

With the beginning of the harmonic era, which dates from about 1600, the treatment of voices naturally underwent a change in conformity with the new musical outlook. Under the earlier contrapuntal system of composition the various independent melodic parts of the chorus had made harmony among themselves as they moved along together, but the harmonies so created were incidental, not deliberately purposed. In the new era which was just dawning composers were going to write from the harmonic point of view; and any musical interest, which the various parts of the chorus might find allotted to them as individual parts, would be there not from design but rather as a fortunate accident. It must not be thought that there was in this, more than in any other evolutionary process, a clear dividing line between the two periods. In the compositions of the whole of the sixteenth century the approach of the harmonic era is foretold, being manifested with growing clearness as the century advances. Palestrina provides many examples of it, and these not the least beautiful portions of his works, where the voices give up their independence for a time and consent to move in blocks of harmony, such as are found in our hymns and simple part-songs. Similarly there were many composers in the seventeenth century who remained, from first to last, entirely out of sympathy with the new movement, and showed their loyalty to tradition by writing on in the contrapuntal style. Probably they cherished as their constant companion the hope that the new methods of the musical revolutionaries might come to naught, but the harmonic style was going to remain, and was to be regarded in the fullness of the time as the most important development in the history of the art.

There is no doubt that in giving up the contrapuntal outlook in favour of the harmonic a real artistic sacrifice was made. Under the former system the melody or chief part was placed in an inside voice, and the surrounding parts, while their function was that of accompanists, were nevertheless directly interesting on their own account. Indeed in the earlier works of this school they were often more so than the *cantus firmus*, which was generally laid out in long sustained notes, the precursors of that 'row of fat semibreves' which, in its association with the present-day study of strict counterpoint, has aroused the ire of some musicians. The first effects of writing in the harmonic style were the total abolition of all melodic interest from the inside parts of a composition, and the substitution of dull successions of notes whose sole function was to assist in providing blocks of harmony on which the melody might rest. The melody was now transferred to the top part where it reigned supreme, with the lowest part, as a kind of chief minister, and the inner parts in a state of complete servility. Thus the ideally perfect equality, which existed among the various voices in the best examples of the contrapuntal school, was replaced by a melodic autocracy of the most emphatic kind. Traces of this undesirable state of things still linger at the present day in the less worthy departments of musical composition, and settings may be found in any of our hymn books in which alto or tenor is condemned to sing through an entire tune on only two notes. The glees and earlier part-songs of the English school are also examples, though less terrible, of the dangers of this facile method of writing to the uncritical composer. But the best writers of the seventeenth century, having consolidated the new system of composition, lost no time in improving the quality of their harmonic writing, and learned that the best way to do this was to revert to the methods of the previous school and write contrapuntally, but on a harmonic basis. By so doing, the melody might still remain of first importance, and the harmonic scheme be still the musical support for it, while the underlying parts were redeemed from the dull monotony which had been so characteristic of the first attempts. The possibilities of this combination of harmony and melodic interest of the parts have not even now been exhausted. As examples of choral compositions in which the contrapuntal element predominates the great fugal choruses of Bach and Handel may be cited, while the harmonizations by Bach of the chorales in his Passion music are wonderful examples of the great beauty and eloquence which may be expressed by purely harmonic methods. Recent composers have sought to extend the range of choral music by increasing the number of parts, and especially by a thoughtful use of the varying tone-qualities that are characteristic of the different registers of the various voices. Among the most successful in this connection may be cited Sir Edward Elgar and Mr. Granville Bantock, who have shown much originality in their choral works. There is also considerable use at the present time of humming effects in choral accompaniment, and the employment of vowel sounds as tonal colour is on the increase. In this manner voices have been introduced in orchestral schemes, as in the *Sirènes* of Debussy.

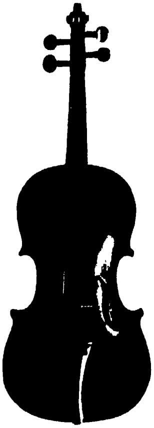
The Song.—It may safely be assumed that rhythm was the first element of music to be appreciated in the infancy of man, and it is probable that melody, the other essential element, began very early to shape itself out of the inarticulate cries of our prehistoric forbears. A study of the savage races of our own day shows them capable of devising short melodic figures, sometimes of only a few notes, which they are inclined to croon in continuous repetition for a few hours on end, and it is reasonable to suppose that our ancestors in their time did what these are doing now. These early melodic figures were the beginning of song, which is thus the oldest form of music-making. The first occasion on which words were allied to vocal melody is lost in the dimness of the past, but song had existed before that time, and the present dawning tendency to use voices without words would seem to indicate that song may return in the future to its first condition of unalloyed vocal melody. Meantime a definition of song which did not include words as an essential feature would hardly gain acceptance.

The history of the song as it is known to-day may be said to begin with the Troubadours, who date from the latter half of the eleventh century. The tunes composed by them, and the other branches of this great fraternity down to the time of the Minnesingers, are of much value in the history of song, but their musical interest for the people of to-day is mainly historical. There can, however, be no doubt that they influenced and in turn were influenced by the folk-songs of the common people, largely through the instrumentality of the Jongleurs, who were the connecting link between the people and the Troubadours, and the last-named are thereby linked up with the modern 'art' song. It is a direct development of the folk-song, which they helped in some degree to bring to its perfect state.

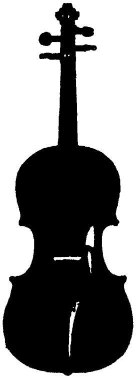
An essential feature of folk-song is the simplicity of the musical means employed. It requires no accompaniment, and the same melody does duty as an expression of the varying sentiments of the different verses of the poem. No doubt folk-songs were as often as not sung to some kind of instrumental accompaniment, and in no way ceased on that account to be folk-songs; but the first occasion on which an instrumental prelude or a symphony between the verses was introduced as a component part of the song may fairly be taken as the beginning of the evolution of the modern vocal solo. Very early in the harmonic era composers occupied themselves with the writing of songs, imitating the simplicity of their model by using the same melody for all the verses of the poem. These compositions, the work of trained composers, had, of course, an accompaniment and sometimes interludes that were an essential part of the song. This, the simplest form of the 'art' product, may be found frequently in the works of Schubert and Franz and many others. Indeed Schubert's output as a song-writer is remarkable not only as regards quantity and quality, but from the fact that the 600 or more specimens he has left include examples of all kinds of song, many being of the simple nature described above. One of his songs, *Who is Sylvia?* affords an admirable illustration of the next step in advance. Here there is again a melody which does duty without change for the three verses of the poem, but there are two features that cannot be associated with folk-song. These are, first, the delightful accompaniment, which, while retaining all the simplicity which rightly attaches to a secondary interest, has an importance of its own derived from the independent rhythmic figure in the bass; second, the interrupting of the course of the melody on two occasions to allow of the interpolation of a short echoing phrase of one bar. From the time when composers first extended the simple scheme of the folk-song the process of development went steadily on, keeping pace with the developing powers of music itself. The accompaniments became more interesting, the scope and eloquence of the vocal part were extended, and an exact musical counterpart of the poem in all its changes of mood was more and more sought after. The logical outcome of this tendency was the *durch-componiertes Lied*, or the song composed 'right through'. Schubert supplied some of the earliest examples of this in such songs as the *Erl King*, and all the best songs of modern times are on the same plan, the present tendency being to seek truth of expression as the first and last essential. The simple accompaniment has grown to something so intimately associated with the voice part that it is now of equal importance with it, and the true designation of the modern product should be a duet for voice and accompaniment. More recently a further significant advance has been made by scoring the accompaniment for a string quartet or some rarer chamber-music combination in place of the simple piano or organ which had formerly sufficed. Before leaving the subject of song, mention must be made of the 'royalty ballad', which flourishes exceedingly in this country, and furnishes almost the sole musical pabulum of many thousands of people. It is a purely commercial department of our musical activities, and the cause of true music and the artistic welfare of our nation would be better served by its total extinction.

Instrumental.—For the purposes of this article musical composition for instruments may be roughly divided into two great periods, the contrapuntal and the harmonic. This is the same classification that was found convenient in connection with choral music, and the change of style in the instrumental sphere began only slightly later than in the sphere of choral composition. It is interesting to consider the reason for the later appearance in instrumental composition of the harmonic style. The voice, the only instrument required for unaccompanied choral singing, is also the only instrument which nature has given to man. It has always been a perfect instrument, and the composer has always had an instinctive knowledge of its possibilities, its limitations, and its proper method of treatment in composition. He had therefore no experimental stage through which he must pass before he could acquire certainty of touch in its use. With instruments the case was very different. In the first period of instrumental com-

Tenor Slide Trombone



Viola



Violin

Oboe

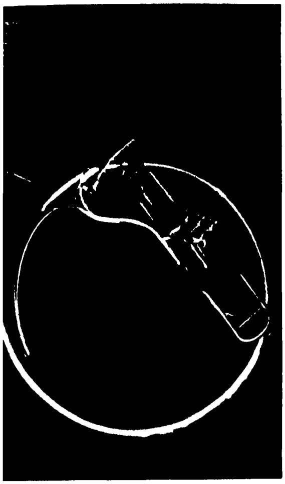
Bassoon

Saxophone

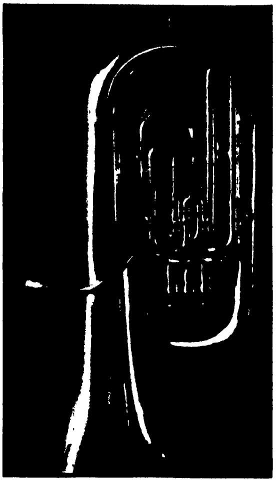
Violoncello

String Bass

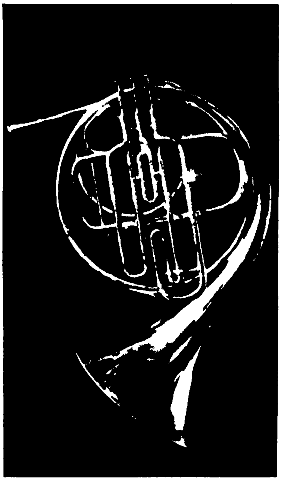
UMENTS



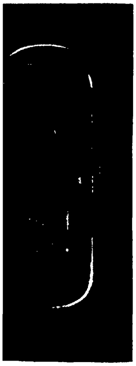
Circular Bombardon



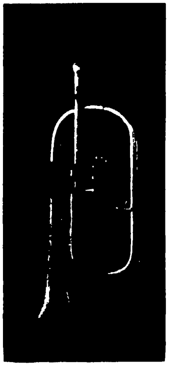
Upright Bombardon



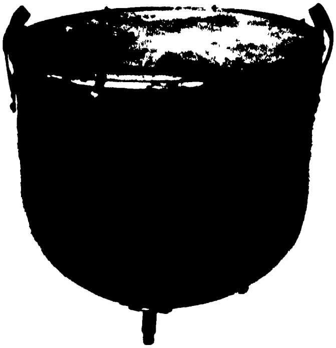
French Horn



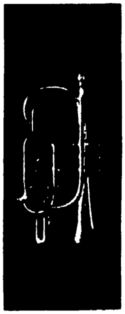
honium



Fluegel Horn

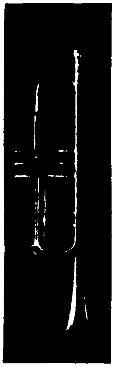


Orchestral Kettle-drum

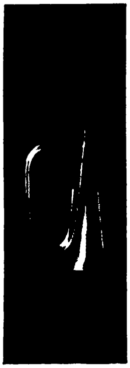


Cornet

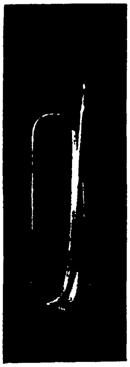
Side-drum



Trumpet



Bugle



Cavalry Trumpet

Piccolo

Flute

position the composer's idiom was contrapuntal, and exactly akin to that of choral music. The instruments themselves were of the kind now only to be found in museums and private collections, comprising the various viols and lutes, and the harpsichord and clavichord, forerunners of the modern pianoforte. So closely did the style of composition for instruments and voices correspond that the common legend on all English publications of the period was "Apt for voices or viols", signifying that the music might equally well be performed in either medium. With the advent of the harmonic style the position as regards voices was unaltered. By their power of sustaining and varying the tone they could still give to the newer music all the eloquence that it was capable of expressing. But the gentle-toned instruments of the period found their best musical efforts quite ineffective in the absence of that continuous movement and imitative 'conversation' of the parts, which was the distinguishing feature of the contrapuntal style. Further, the coming remarkable development in the making of violins was just about due (the great Amati was born in 1596 and Stradivarius and Guarnerius about half a century later), and the transition to the newer class of instruments would further tend to delay the time of adopting the new harmonic style. But the chief reason for delay was that composers did not know at first how to adapt the harmonic idiom to instrumental requirements. Like every other forward move in the evolution of music, this one of discovering how to make the new style effective in instrumental composition had to be worked out by laborious thought and patient experiment. The idea of the presentation of instrumental harmonies by means of arpeggios and decorative passage-work is so familiar to the present generation that it is difficult to realize that such a seemingly obvious method of procedure had to be discovered. But such was the case. The overlapping of the old and new methods which has been referred to in connection with choral music was also a feature of the change in the instrumental sphere. The great example of adherence to the contrapuntal methods is J. S. Bach, who, though he lived till 1750 and wrote a large amount of music for keyboard instruments and strings, made only a very limited use of the purely harmonic idiom. The great Italian school of violinists includes followers of both styles. Corelli, who was the first of the school and died in 1718, was a worker in counterpoint, but the many brilliant players who immediately succeeded him, and who were mainly his pupils, belonged for the most part to the new school of composition, and based their creative work on harmonic principles.

Something must now be said regarding the vital part played by these harmonic principles in the development of music. Under the contrapuntal methods of writing music it was not possible to extend the duration of any composition beyond a certain time, which never amounted to more than a few minutes. This was solely because the contrapuntal idiom did not contain within itself the germ of any considerable musical development. This great lack was supplied by giving music a harmonic basis, though it is not probable that the early workers in this new medium could foresee that on this foundation it would be possible in the not distant future to raise such mighty sound-fabrics as the symphonies of Beethoven and the operas of Wagner. What made such achievements possible was the principle of key relationship. In the melodic methods of the contrapuntal school certain melodic formulæ had been universally accepted as appropriate for use in bringing a phrase or a composition to a close, and in adapting the same principle to the new harmonic conditions a like effect of partial or complete finality was obtained by the use of certain harmonic formulæ called cadences. As a cadence, when presented harmonically, clearly defined the key to which it belonged and excluded all other keys, it was possible by means of it to convey a very definite sense of tonality. Further, by the use at appropriate points of different cadences, it was possible to give the listener a very clear sense of different keys. On this element of key contrast the fabric of modern music has been raised, and the growth and development of the various kinds of musical form made possible. The simplest application of the principle of key contrast is exemplified by ternary, or three-part form. This consists of an opening section in a certain key, an episode or middle section in a contrasted key, and a third section which gives in the original key a more or less faithful repetition of the opening part. This simple scheme may be seen in its simplest manifestation in many of our folk-songs, and in its most imposing form in all the great overtures, symphonies, and works in chamber music. Everything indeed in modern music will be found to be based on the simple fact of key contrast, and it is the glory of the harmonic period of instrumental development that it has achieved the wonder of the great and ever-satisfying musical forms.

The Orchestra.—It is only in comparatively recent times that the term 'full orchestra' has taken on a definite meaning, and suggests to the musical mind a fairly standardized collection of instruments. In the sixteenth century a composer would seem to have employed in his instrumental accompaniments any and every instrument that might be available, and this heterogeneous collection of tone colours was used without any seeming desire to make the best of it. The most important musician of that epoch, so far as the modern orchestra is concerned, was Monteverde, who, by greatly increasing the number of stringed instruments played with a bow, made the first step of real advance. The string department of the orchestra, which he thus brought into being, still to-day supplies the foundation tone. In the time of Bach and Handel not a great deal of progress had been made. The writing for instruments was naturally much more mature, but there was no sign of any desire to use the tone colours with sensitive artistry. The ideas of suitable orchestration got no further than the general use of the string band for practically all purposes, and the application of colour by the addition to the score of an oboe d'amore or a flute, which seldom had anything distinctive or characteristic to play, but rather followed the first violin part in the most slavish fashion. For full effects and massive choral accompaniments trumpets and drums would be used, and in the orchestra of Handel's day the tutti would include large masses of oboes and bassoons, the former being sometimes as numerous as the first violins. With the beginnings of the symphony a change came, and the possibilities of artistic instrumental combination and subtlety of tone-colour effects began to dawn on the minds of composers. Haydn and Mozart were among the first to use the forces of the orchestra on the lines to which the audiences of to-day are accustomed, treating the wind instruments, for example, with an independence and an appreciation of their tonal qualities that was quite new. The clarinets were introduced to the orchestra by them but were only used occasionally. Since their day every great composer has added to the orchestral resources till the full modern orchestra has become so large as to be almost overgrown. A natural reaction from this situation is evident in the latest tendency to write for orchestra on chamber-music ines, getting effects, not so much by a massed use of the instruments, as by a more sparing and more subtle arrangement of the colour scheme. The earliest example of this manner of writing for orchestra was provided by Wagner in his *Siegfried Idyll*, and the present movement in emulation of its delicate beauties is one that seems to hold promise for the future.

Musk, a substance used in perfumery and medicine, and obtained from several species of deer. (See *Musk-deer.*) A perfume of similar character is also obtained from one or two other animals (see *Musk-rat*); and various animals and plants are noted for emitting a strong musky smell.

Musk-deer, a genus of deer, forming the type of a sub-family (Moschinæ) of the Cervidæ, or deer family. Their chief habitat is Asia and the islands of the Eastern Archipelago, though one species is found on the west coast of Africa. The typical species of the family is the *Moschus moschifĕrus*, found chiefly in the elevated tablelands of Central Asia, and particularly of Tibet. These animals attain the size of a young roe deer, and the upper jaw bears prominent canine teeth. The males alone yield the *musk*, which is secreted by an abdominal gland of about the size of a hen's egg. The Tibet musk is most in repute, that known as Russian or Siberian being inferior in quality. Besides its familiar use as a scent, musk is employed medicinally as an antispasmodic.

Musk-deer (*Moschus moschifĕrus*)

Musk-duck, a species of duck, often erroneously called the Muscovy-duck (*Cairina moschăta*), a native of America, but now domesticated in Britain. It has a musky smell, and is larger and more prolific than the common duck.

Muske'gon, a city of Michigan, United States, county seat of Muskegon county, on the Muskegon Lake; served by the Père Marquette and Grand Trunk Railways, and by lake steamers. There is a good harbour; lumber and fruit are exported. Manufactures include pianos, refrigerators, and furniture. Muskegon was settled in 1834, incorporated in 1861, and became a city in 1870. Pop. (1920), 36,570.

Musket, a hand-gun with which infantry soldiers were formerly armed. When first introduced, early in the sixteenth century, as a development of the culverin and arquebus, it was discharged by means of a lighted match (hence the name *matchlock* given to it), and was so heavy that it had to be laid across a staff or *rest* to be fired. To make use of it the soldier required to carry a slow-burning match with him, which was apt to be extinguished in wet weather. The wheel-lock followed (sixteenth century), the chief feature of which was a wheel made to revolve by means of a spring, and to cause sparks by friction against a flint. The next improvement was the flint-lock proper (about 1625), in which sparks were produced by the impact of a piece of flint on the steel above the priming powder. Musketeers were soon introduced into all armies, and in the beginning of the seventeenth century infantry consisted of pikemen and musketeers, and all changes in regard to the relative proportion of the two arms were always in favour of the latter. The flint-lock musket was introduced into the British army towards the end of the seventeenth century, and was the British musket of the days of the Peninsular War and Waterloo, known familiarly as 'Brown Bess'. It was superseded by the percussion musket in 1842, this musket being in turn superseded by the rifle. See *Rifle*.

Musketry, a term used to describe all forms of training and practice in the mechanism, care, theory, and practical use of all military small-arms. Time was when the whole art of musketry began and ended in the ability of the soldier to load and fire his piece without damage to himself and with problematical danger to his enemy, and in those days, when drill (q.v.) was everything and practical training—in view of the nature and conditions of war—a secondary consideration, and when, moreover, eighteen separate motions were considered necessary before a musket could be fired, this standard would appear to have met the case. It is, however, of some interest to note that as far back as the first few years of the nineteenth century, and many years before musketry *per se* received any recognition, the author of a military drill-book in very general use comments on the entire absence of instruction in these words. Under the heading of 'Firings', to which he dedicates only ten pages out of a total of 250, he says: "There is no doubt, too, that the fire of the musketry may be reduced to a theory; but far from that being the case, the soldier has no principle given him, for, let the distance or situation be what they may, he fires at random. It is principally owing to the exercise of the target being so little practised that this ignorance and deficiency of principle is so severely felt." Admirable sentiments, no doubt, but it was many years before they were recognized to any extent. When the art of musketry did at last begin to be practised, it was at best a perfunctory sort of performance, and at one period if a soldier could even hit the target—a large one—he was allowed to go home, and was not required to fire again till the following year.

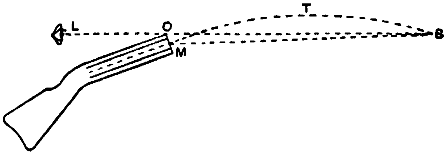
Then, following the improvement in fire-arms, considerable interest began to be taken in target shooting, i.e. firing at a large square iron target painted white with a black bull's-eye. Up to about the time of the South African War this was the principal item of musketry training; there were, indeed, practices dignified by the name of 'field' practices, but they took place either on the range from measured firing-points, or on some convenient area of country, the one and only idea being to get as many hits as possible, the targets being of a suitable size and shape to ensure this. In short, the aim of all musketry training was to make the soldier a good individual shot at known distances, under easy conditions, and with ample time allowed for each shot; when combined fire effect was thought of at all, it was considered sufficient if a section of twenty men could fire a volley at the command of their leader, by far the greater importance being laid on the simultaneous discharge of the rifles than on the question as to whether the rifles were being aimed at the desired mark, or even whether the individual knew what he was expected to fire at. Now all this is altered, and musketry does not mean merely the ability to make 'bull's-eyes' at 800 yards or 'possibles' at 500 yards; in fact the regulations go so far as to point out in quite unmistakable language that the one aim and object of rifle shooting is not 'pot-hunting'. Instead, "The purpose of musketry training is to render the individual soldier proficient in the use of small-arms, to make him acquainted with the capabilities of the weapon with which he is armed, and to give him confidence in its power and accuracy; and to qualify officers and non-commissioned officers to direct and control fire under service conditions." These requirements are met by a system of gradual training throughout a soldier's service, particular stress being laid on the necessity of combining musketry training with other tactical exercises, and this perhaps will best be explained by a brief description of the training favoured by the British army. This course is divided into two separate and distinct portions, the first known as the Recruits' Course, and the second as the Trained Soldiers' Course. As the name implies, the Recruits' Course is an elementary one, in which the young soldier is given a thorough grounding in the use of the rifle, its mechanism, and the names and uses of its various component parts. He is then given instruction on the important matter of how to look after and keep in good working order the weapon on which some day he may have to depend for his own life and the lives of his comrades. Having been taught these preliminaries in a very thorough manner, he is then taken on to the elements of the 'theory of rifle fire', and given practical instruction in aiming and firing a rifle without ammunition. During this period he is shown at intervals how to improve his power of perception of objects at a distance, how to recognize objects described by his immediate commander, and how to determine by eye the distance of such various objects. Then, after some preliminary practice on miniature ranges (with the miniature rifle) and on 30-yard ranges (with special ammunition), both being designed to accustom him in some measure to the discharge of the rifle, he is given his first introduction to the open rifle-range, where he fires with service ammunition and at ranges varying from 100 to 600 yards.

The normal amount of ammunition to be expended on the range by a recruit is 200 rounds, but, as it is very necessary to give a young soldier a thorough grounding in this most important part of his training, additional ammunition is allowed to permit of certain instructional practices being repeated till a satisfactory standard is reached. Targets used in this course are either a 4-foot square white target with an 8-inch bull's-eye, known as an elementary target, or a figure target 4 or 6 feet square covered with two neutral shades of paper, on which is applied a small figure 12 or 18 inches high, made of brown paper. From this description it may be seen that in the earlier stages of the course the recruit has a well-defined mark to aim at in the black bull's-eye on a white ground, while, as the course progresses, he is given the same or even a larger-sized target, but of a much less distinct nature.

It is impossible in the scope of this article to enter into any great detail on each separate item of a soldier's training, but a brief explanation of the different kinds of range practices fired by a recruit will show how detailed is this training. The course is divided into six parts, four of which are termed instructional, while the remaining two consist of individual and collective field practices.

In the instructional parts the soldier fires certain practices known as 'grouping', which are intended to discover faults either in rifle or man; with this end in view the whole series of shots is fired with exactly the same sighting and aiming-point, and the result is not known till the last shot has been fired. Other practices are known as 'application', and in these the result of each shot is signalled, and the soldier corrects or alters his sighting or aim as necessary. All 'grouping' and some 'application' are fired at bull's-eye targets, but most of the 'application' practice and all 'rapid' and 'snap-shooting' ones which follow are fired at figure targets as above. As for the position of the firer, lying, either with or without a rest, is the normal one, though a few practices are fired kneeling behind cover. In 'field practices' the soldier is able to apply the knowledge he has gained on the range by firing at targets arranged to represent to some extent what he *might* see in war. Having satisfactorily completed this course, the soldier ceases to be a 'recruit' and becomes a 'trained soldier', and for the rest of his service will fire annually a more elaborate and more searching course, designed to keep up his musketry sense and to fit him to pull his weight as one member of a fire unit in war.

In musketry, as in many other crafts, an ounce of practice is worth a pound of theory, yet a considerable knowledge of elementary theory is, as has already been said, expected of the soldier. "A knowledge of the theory of rifle fire is of great importance . . . but it is of equal importance that such knowledge should be correctly applied." Theory—sufficient for the purpose—is taught to the recruit by means of short lectures and explanations, by diagrams, by practical demonstrations when such are possible, or by mechanical means. The instruction begins by the young soldier being given various definitions relating to rifle fire which are necessary for his purpose. Among such are: 'line of fire—a line joining the muzzle of the rifle and the target', 'line of sight—a line passing through the sights and the point aimed at', 'trajectory—the path the bullet takes on its journey from the muzzle to the target'. Then, in order to explain why these do not all mean the same thing, a description of the forces which act on the bullet (q.v.), leading to a dissertation on 'elevation' and 'sighting', has to be given. The recruit thus learns why somewhat complicated sights are fixed on to his rifle, what would happen if the rifle were fired without their aid, and the why and the wherefore of the continual practice in adjusting his sights which he receives daily, and which on a cold morning he finds most unpleasant. Then, later on, the effect of winds on a bullet is dealt with, and the reasons for alteration of aim in order to counteract it deduced, and the influence of ground in relation to fire-effect dealt with.



Musketry

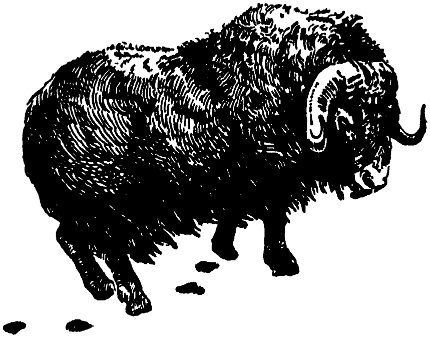
LOS, Line of sight. MS, Line of fire. MTS, Trajectory

In conclusion it should clearly be understood that the mere outline of a soldier's musketry training given above is simply a means to an end. In the words of the Regulations "... the soldier should attain a high standard of skill in shooting at known distances, under easy conditions and in various positions ... he should have confirmed in practice the lessons learned in preliminary training, and be thoroughly acquainted with the peculiarities of his rifle ... he has fired in the open and from behind cover ... and should have learned the rate of fire which in his own case best combines volume with accuracy ... he has been brought to realize the necessity for rapid alignment of sights and the value of time in taking advantage of targets exposed under service conditions. ... Range practices are in no sense a final training, and it is essential that further practice should take place under service conditions."

This further practice takes the form of the already-mentioned 'field practices', which, fired off the usual rifle ranges on any ground which can be made available, are carried out in as near an approximation to active-service conditions as may be. Field practices are both 'individual' and 'collective'. In the former, which are fired at ranges under 600 yards, men work in pairs, a target of sorts being provided for each; while one man fires the other assists by observing the effect of the shot. 'Collective field practices', on the other hand, are carried out by 'fire units' or sections acting under the orders of the commander, and, this being so, 'the value of the fire will depend almost entirely on his ability to apply the fire to the target'. In other words, the efficiency of the section or fire unit commander is, in this form of firing, of the utmost importance. Collective firing means firing with others at a probably ill-defined mark selected and described by a commander, who at the same time observes (if he can) the results of the fire and modifies his orders accordingly. Unless, therefore, the section commander is well trained in giving clear and concise orders, in describing the required aiming-point unmistakably, in estimating the range, and in controlling and regulating the rate and volume of fire under the conditions of active service, the collective fire of his section will be little better than a waste of ammunition. All this is no doubt somewhat in the nature of a child's demand for the moon, as active service conditions are not and never can be comparable with those of peace-time 'field practices'; yet, on the principle that 'Rome was not built in a day', the army goes on with its musketry training in the certain knowledge that some at least of the principles inculcated in peace-time will hold good when tried in the furnace of war. In any case, we have advanced far beyond the ideals contemplated by the old writer whose words are quoted at the beginning of this article. See *Fire Tactics*. Cf. *Musketry Regulations, Part I* and *Part II*.

Musk-mallow (*Malva moschāta*), a British perennial plant, so named from the peculiar musky odour thrown off by all parts of the plant.

Musk-ox (*Ovibos moschātus*), an animal intermediate between the ox and sheep. Resembling in general appearance a large goat-like sheep, its body is covered with a coat of tufted hair, brownish in colour and of great length. The hair about the neck and shoulders is so thick as to give the animal a 'humped' appearance; on the rest of the body it is very long, smooth, and flowing, while interspersed among its fibres is a layer of lighter-coloured wool. The musk-ox is active and agile, and climbs mountainous places with ease and dexterity. The horns, broad at the base and covering the forehead and crown, curve downwards between the eye and the ear, and then upwards and slightly backwards. The horns of the female are smaller than those of the male, and their bases do not touch. The ears are short, the head large and broad, the muzzle blunted. The average size of the male is that of a small domestic ox. Gregarious in habits, each herd numbers from twenty to thirty members. The female brings forth one calf in May or June. The food consists of grass, lichens, &c. The musk-ox inhabits the Arctic regions of America north of the 60th degree of latitude. The flesh is pleasant to the taste, though it smells strongly of musk, the odour of which is also diffused from the living animal.



Musk-ox (*Ovibos moschātus*)

Musk-plant, a little yellow-flowered musky-smelling plant of the genus Mimulus (*M. moschātus*), a native of Oregon, but now a common garden plant in Britain.

Musk-rat (*Fiber zibethicus*), an American rodent allied to the beaver, and the only known species of the genus. It is about the size of a small rabbit, and has a flattened lanceolate tail, covered with small scales and a few scattered hairs. Its toes are separate, and provided with a stiff fringe of hair. In summer it has a smell of musk, which it loses in winter. The odour is due to a whitish fluid deposited in certain glands near the origin of the tail. Of considerable commercial importance on account of its fur, the musk-rat, or *musquash* as it is popularly called in America, from its Indian name, is taken in large quantities, the skins of from 400,000 to 500,000 being annually imported into Britain. Very common in North America, the musk-rat lives along the margins of streams, in the banks of which it makes its nest. The musk-rats of Europe, or desmans (*Myogālē moschāta* and *M. pyrenaica*), are aquatic insectivorous animals allied to the shrews and moles, having a long flexible nose, and a double row of glands near the tail secreting a substance of a strong musky smell; found in Southern Russia and the Pyrenees. The musk-shrews (Crœidura) comprise about eighty species inhabiting South and Central Europe, Africa, and South Asia.

Musk-rat (*Fiber zibethicus*)

Musk Tree, or **Musk Wood**, the names of trees and wood that smell strongly of musk. The musk wood of Guiana and the West Indies is *Guarea trichilioides*; the musk tree of Tasmania, *Eurybia argyrophylla*.

Muslin, a fine thin fabric, usually made from cotton yarns, but occasionally made from silk or worsted yarns; it is supposed to have been first made at Mosul or Moussul (whence the name), afterwards in India (Madras muslin), and first imported into England about 1670. About twenty years afterwards it was manufactured in considerable quantities both in France and Britain, and there are now many different kinds made, as *book*, *mull*, *jaconet*, *leno*, *foundation*, &c. The chief centre of manufacture in this country is Glasgow. These fabrics are extensively used for window decoration, and compete, more or less successfully, with lace curtains. Some Indian muslins, e.g. Dacca muslin, are of extraordinary fineness, and attempts to rival them are very rare. Figured muslins are now very common, and were probably first made to imitate *tamboured* muslins, or muslins embroidered by hand. Lappet fabrics are somewhat similar in structure to muslins, but are made in an entirely different loom. Moreover, they are not so elaborately figured as the modern muslin curtains.

Mussel, a term popularly given to several bivalve molluscs, section Asiphonida, or those in which 'siphons', or tubes admitting water to the gills, are absent. The common mussel (*Mytĭlus edūlis*) forms a typical example of the family Mytilidæ, the shells of which family are equivalve, and have a hinge destitute of teeth. It has a 'byssus' or 'beard', by means of which the mussels attach themselves to fixed objects. The mussel is extensively employed in Scotland by deep-sea fishermen as bait; and in some districts it is used as an article of food, the best mussels approaching nearly to the oyster in flavour, though occasionally found to be unwholesome. It is cultivated as an article of diet on the European continent, the 'mussel-farms' of the Bay of Aiguillon, near Rochelle in France, forming the most notable example. The family Unionidæ includes the freshwater or river mussels (Unio) and the swan or pond mussels (Anodonta). The Unionidæ inhabit fresh water exclusively. The pond mussels, of which many species are known, are found in the rivers and lakes both of Europe and America. The hinges of the shell in the genus Anodon are destitute of teeth, in the genus Unio toothed. The *Unio pictorum* is a familiar species. The *Unio margaritifĕrus*, or pearl-mussel, has attained a reputation from the fact that it has yielded pearls of considerable value in the Don, Tay, Doon, Forth, Spey, and other British streams.

Musselburgh, a municipal and police burgh of Scotland, in Midlothian, 6 miles east of Edinburgh by the North British Railway; on the Firth of Forth, at the mouth of the Esk, which divides it into two parts, ancient Musselburgh and Fisherrow. It has a bridge, believed to be of Roman erection; and a curious old tolbooth. There is a race-course and an annual race-meeting, golf-links, and some sea-bathing. Fishing is the principal industry. The battle of Pinkie (1547) was fought in the vicinity. Pop. (1921), 17,110.

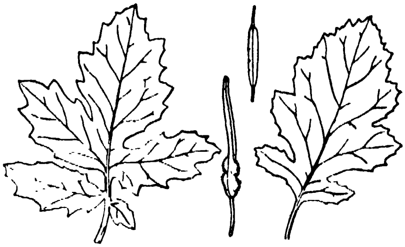
Musset (mù-sā), Louis Charles Alfred de, French poet, novelist, and dramatist, born at Paris in 1810, died there in 1857. After trying various professions he gave himself up wholly to literature, and in 1829 published a volume of poems called *Contes d'Espagne et d'Italie*, which had an immediate and striking success. In 1831 appeared *Poésies diverses*, and in 1833 *Un spectacle dans un fauteuil*, in which the two chief pieces are a comedy of a light and delicate grace called *A quoi rêvent les jeunes filles*, and a poem entitled

Namouna, written after the manner of Byron. In 1833 he travelled in George Sand's (Amandine Dudevant) company, but their intimacy soon came to an end. In 1836 was published his *Confession d'un enfant du siècle*, a gloomy novel, containing the analysis of a diseased state of mind, all the phases of which the author had studied in himself. The same settled melancholy also distinguishes his *Rolla*, *Une bonne fortune*, *Lucie*, *Les Nuits*, *Une lettre à Lamartine*, *Stances à Madame Malibran*, *L'Espoir en Dieu*, and other poems. Among his light and sparkling dramatic pieces are: *On ne badine pas avec l'amour*, *Les Caprices de Marianne*, *Il ne faut pas jurer de rien*, &c. In 1848 Musset was deprived by the Revolution of the situation of librarian to the Ministry of the Interior, a sinecure which he had obtained through the favour of the duc d'Orléans; but he was restored to this post under the Empire, and was in addition appointed reader to the empress. In 1852 he was admitted a member of the French Academy. De Musset was one of the most distinctive, and, in a certain sense, original of modern French writers. At a time when the battle between the Classicists and Romanticists was at its height he took sides with neither, but made for himself a style combining the excellences of the two schools. His elder brother Paul was also a writer of some ability, but always overshadowed by the brilliance of Louis.—BIBLIOGRAPHY: E. Dowden, *Studies in Literature*; Arvède Barine, *Alfred de Musset*; Sainte-Beuve, *Causeries du lundi*; Jules Lemaître, *Introduction au théâtre de Musset*.

Mussolini, Benito, Italian politician, was born 29th July, 1883. He was a journalist, and at one time a socialist leader; but he became the principal organizer of the Fascist movement, and was made Prime Minister of Italy in 1922. Several attempts on his life have been made, but each has only established him more securely as an absolute dictator.

Mussoo'ree, a hill-station in Dehra Dun district, United Provinces of India, in a picturesque situation among the Himálaya at the height of 7583 feet. Summer pop. about 12,000.

Mustard, the common name of plants of the genus Sinăpis, nat. ord. Cruciferæ. The seeds of the *S. alba* and *S. nigra* (white and common mustard), when ground and freed from husks, form the well-known condiment of the shops. The plant is an annual, with stems 3 to 4 feet in height, lower leaves lyrate, upper lanceolate and entire, flowers small and yellow. The preparation from the seeds is often very valuable as a stimulant to weak digestion, and as an adjunct to fatty and other indigestible articles of food. When mixed with warm water and taken in large quantities it acts as an emetic. The tender leaves are used as a salad, and the seeds of *S. nigra* are used in the well-known form of poultice, being applied to various parts of the skin as a rubefacient. *Wild mustard* or *charlock* (*S. arvensis*) is a troublesome weed in cornfields, often making them yellow with its flowers. Its seeds are said to have yielded the first Durham mustard, and they are still gathered to mix with those of the cultivated species.—*Oil of mustard* is an essential oil obtained from the seeds of *S. nigra*. It is very pungent to the taste and smell, and when applied to the skin speedily raises a blister.


Leaves and Pods of White Mustard (left), and Black Mustard (right)

Mutiny, resistance by soldiers or sailors to the authority of their officers. In the British army it was formerly dealt with under the Mutiny Act, which was passed annually up to 1879, but has since 1881 been superseded by the Army Act. Joining in, inciting to, or conniving at mutiny is punishable with death, whether the troops are on active service or not; on active service the same sentence may follow treachery or cowardice, deserting a post, &c. Special Reserve and Territorial troops are subject to the Mutiny Act. The government of the Royal Navy is regulated by an Act of 1866, which contains an enumeration of nearly every possible offence, and annexes a certain punishment.

Muttra, a town of the Agra division, United Provinces, India, on the Jumna, and an important railway junction. It is an old Hindu city, one of the most artistic and interesting in India, being regarded as the birth-place of Krishna. Pop. 54,000.—The Muttra district has an area of 1453 sq. miles; pop. 650,000.

Muzaffargarh, a town of India, in the Multan division of the Punjab, on the Chenab, around a fort built by Nawab Muzaffar Khan. Pop. 4500.—The district has an area of 6000 sq. miles; pop. 570,000.

Muzaffarnagar, a district of India, in the Meerut Division of the United Provinces. Area, 1700 sq. miles; pop. 800,000. The capital is Muzzaffarnagar, founded by Muzaffar Khan, about 1633. It has railway connections with Meerut and Delhi. Pop. 24,000.

Muzaffarpur, a district of India in the Tirhut division of Bihar and Orissa. Area, 3000 sq. miles; pop. 3,000,000. The capital is Muzaffarpur on a former bed of the Little Gandhak River, a centre of the indigo industry, and a divisional head-quarters.

Mwanza, a province of Tanganyika Territory, East Africa, lying around Lake Victoria and between Kenya Colony and Bukoba, with the boundary-line passing through Lake Eyasi. Mwanza, a wireless station and port on Lake Victoria, is the administrative centre. It was captured by General Crewe and a British force advancing on Tabora on 14th July, 1916 (European War). Pop. of town, 4000.

Mweru, a lake of Central Africa, on the Belgian Congo-Northern Rhodesian frontier, fed by the Luapula River. The Mweru Marsh is a big game preserve and elephant breeding-ground. Mweru was discovered by Livingstone (1867), and was formerly of much greater extent. Length, about 68 miles; average breadth, about 20 to 30 miles.

Myce'lium, the name given to the characteristic thallus of Fungi. It consists of whitish, richly branched filaments (hyphæ) which spread like a network through the substances on which the Fungi grow. See *Fungi*.

Myce'næ, an ancient city of Argolis, in the Peloponnesus. It is said to have been founded by Perseus, and before the Trojan War to have been the residence of Agamemnon, in whose reign it was regarded as the leading city in Greece. Its ruins are extremely interesting from their antiquity and grandeur. They were investigated by French archæologists in 1822. Among them are the Lion Gate, and the vaulted building of enormous stones called the *Treasury of Atreus*, &c. In 1876 Schliemann carried out excavations here with valuable and interesting results. The researches were continued by the Greek Archæological Society. New researches were made at Mycenæ in 1920.

Mycorhiza, a peculiar state of coalition between a fungus and one of the Higher Plants, in which both parties derive benefit from the association. It is commonest among the Flowering Plants. All the so-called saprophytic Angiosperms are of this type (e.g. bird's nest orchid), but also many others, such as heather, orchids generally, Scots pine, oak, and many other forest trees.—Cf. F. O. Bower, *Botany of the Living Plant* (chap. xi).

Myeli'tis is an inflammation of the spinal cord. The disease may take several forms, but the most common is acute transverse myelitis. This is usually syphilitic in origin. The onset is characterized by numbness and tingling of the feet and legs, followed by loss of power, while sensation is soon lost and retention of urine appears. The skin becomes dry, and as the condition advances bed-sores develop. The limbs are at first flaccid, but afterwards become rigid.

Myelitis, in cattle, inflammation of the spinal cord. The disease comes from a variety of causes, and generally results in paralysis. Symptoms include an unsteady gait, coldness of the affected limbs, convulsions perhaps at first, and tenderness along the spine. The treatment includes bleeding and purging, 1 oz. of chloral hydrate being administered with the purgative, and the dose repeated if necessary. A counter-irritant, such as turpentine and oil, along the spine has a good effect after a day or so. Some unpromising cases frequently recover, and slaughter should only be resorted to as a last resource. Subjects that are unable to rise should occasionally be turned over and given a dry bed.

Myg'alē, a genus of spiders, the type of the family Mygalidæ, furnished with four lung sacs and spiracles, four spinnerets, eight eyes, and hairy legs. Their nests, constructed of silk, are built in clefts of rock, trees, &c., and in the ground. The bird-catching spider of Surinam belongs to this species; other larger species frequently prey on small vertebrate animals, not by laying snares for them, but by regularly hunting them. They envelop their eggs in a kind of cocoon.

Mylab'ris, a genus of beetles nearly allied to the Cantharides (q.v.), noteworthy because of the use made of some species as a blister-fly.

My'lodon, a genus of extinct edentate Mammalia, allied to and ancestor of Megatherium. Its remains have been found in the Miocene, Pliocene, and Pleistocene strata of South America. *Mylodon robustus*—the most familiar species—attained a length in some instances of 11 feet. Of terrestrial habits, Mylodon obtained the vegetable food upon which it subsisted chiefly by uprooting trees. Mylodon reached North America in Pleistocene times.

Myogale. See *Musk-rat*.

Myoso'tis, a genus of plants belonging to the Boraginaceæ, and comprising numerous European and Northern Asiatic, a few North American, and three or four Australian species. The *M. palustris* is the well-known forget-me-not. Other species are popularly known as scorpion-grass.

Myriap'oda (Gr. *myrioi*, ten thousand, and *pous*, *podos*, foot), the lowest class of the higher annulose or arthropodous animals, represented by the centipedes, millepedes, and their allies, and resembling the Annelids in the lengthened form and the numerous segments of the body, each segment being provided with one or two pairs of ambulatory feet, whence the name. They have a distinct head, but no division of the body into thorax and abdomen, as in insects. They are therefore of a lower structural type than insects, which in general organization they resemble. No wings are developed. They respire through minute spiracles or pores along the whole length of the body, and are invested with a hard chitinous or horny covering or exoskeleton. This class is divided into two orders, the Chilognatha or Diplopoda, in which the fusion of two rings gives apparently two pairs of feet on each ring; and the Chilopoda, which have two pairs of foot-jaws or maxillipeds, and not more than one pair of feet on each segment.

Myrica, a genus of apetalous Dicotyledons, forming the ord. Myricaceæ, allied to the walnuts. They are shrubs with glandular aromatic foliage, natives of temperate regions and tropical mountains. *M. Gale* is the sweet gale, common in the Scottish Highlands; *M. cerifera* is the candleberry.

Myris'tica, the only genus of the nat. ord. Myristicaceæ. *M. fragrans*, a native of the Moluccas, yields the nutmeg of the shops.

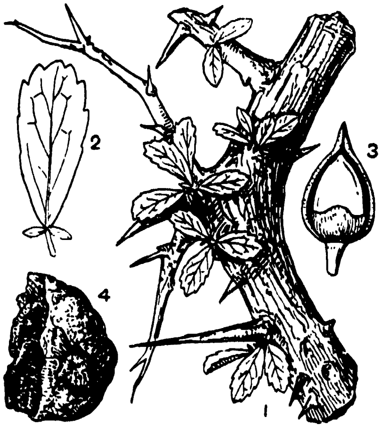
Myrmecophilous Plants, those which have ants living permanently on them in preformed cavities of the stem or leaf; usually nutriment in the shape of special glands (food-bodies) or extra-floral nectaries is provided as well as lodging. In return for these benefits the ants are believed to afford protection against leaf-cutting ants, browsing animals, &c., but the evidence for this is not conclusive in many cases. See *Bull's Horn Thorn*; *Cecropia*; *Clerodendron*.

Myr'midons, an ancient Greek people of Thessaly, who accompanied Achilles to the Trojan War. They are said to have emigrated into Thessaly under the leadership of Peleus. The term has come to signify the followers of a daring and unscrupulous leader, or the harsh and unfeeling agents of a tyrannical power.

✗ **Myrobalan** (mī-rob'a-lan), a dried fruit of various species of trees, brought from the East Indies, all slightly purgative and astringent. Myrobalans are used by the Hindus in calico-printing and medicine, and are imported into Britain for dyers and tanners, especially the latter. They are the produce of several species of Terminalia (ord. Combretaceæ), the chief of which are the belleric myrobalan (*T. Bellerica*) and the chebulic (*T. Chebulica*).

My'ron, one of the chief sculptors of the older Attic school, who flourished in the middle of the fifth century B.C. He excelled in the representation of action, and was famous as a sculptor of animals. No examples from his own hand have survived, but the Lancelotti *Discobolus* (or Disc-thrower) at Rome, and the small bronze *Marsyas* in the British Museum are accepted as antique copies of his work. In his manner are the *Idolino*, at Florence, and the bust of *Pericles*, in the British Museum. See *Sculpture*.

Myrrh is the name given to a gum resin which exudes from a shrub growing in Arabia and Abyssinia, called *Balsamodendron Myrrha*. It was much esteemed as an unguent and perfume by the ancients, who used it also for embalming and for incense. It is still used as a perfume and for incense, as also medicinally. By distillation with water myrrh yields a viscid, brownish-green, volatile oil. Myrrh of the best quality is known as Turkey myrrh; that of an inferior kind goes under the name of East Indian, being exported from Bombay.



Myrrh (*Balsamodendron Myrrha*)

1, Plant. 2, Leaf enlarged. 3, Fruit with husk half removed. 4, Piece of Myrrh.

Myrta'ceæ, the myrtle tribe, an extensive and important natural order of polypetalous exogens, mostly inhabiting warm countries, and in all cases either shrubs or trees. They have simple entire leaves, often dotted with resinous pellucid glands and regular, axillary and solitary, or spiked, corymbose, or panicled white, pink, or yellow (never blue) flowers, with numerous stamens. Some yield useful products, such as guavas, cloves, pimento, and cajeput oil. The eucalypts or gum trees are characteristic of Australia.

Myrtle (Myrtus), a genus of plants, nat. ord. Myrtaceæ, consisting of aromatic trees or shrubs, with simple opposite leaves sprinkled with pellucid glandular points, and having axillary or terminal white or rose-coloured flowers. One species, the common myrtle, is a native of the south of Europe and other countries bordering on the Mediterranean. It has been celebrated from remote antiquity on account of its fragrance and the beauty of its evergreen foliage, and by different nations was consecrated to various religious purposes. With the moderns it has always been a favourite ornamental plant. In the British Islands the myrtle flourishes in the open air only in the southern counties of England and Ireland. Farther north it must be treated as an exotic.

Mys'ia, in ancient geography, a country in the extreme north-easterly corner of Asia Minor, on the modern Ægean, Dardanelles, and Sea of Marmara. The Mysi were a Thracian people who migrated into Asia. Their country fell to Crœsus, King of Lydia, in the sixth century B.C., passed to the Persian Empire, fell to Syria (323 B.C.), and became part of the Roman Empire in 133.

My'sis, the opossum-shrimps, a genus of crustaceans belonging to the ord. Stomapoda. They are the chief crustaceans of the Arctic Ocean, and constitute the principal food of the whalebone whale.

Mysore', a native state of Southern India. It is enclosed east and west by the Eastern and Western Ghâts, and on the south by the Nilgiri Hills, and consists of tablelands about 2000 feet above the level of the sea. The only river of importance is the Kaveri. Irrigation is extensive, sagi, a native millet, cotton, sugar-cane, and rice being produced. Gold and manganese are worked. Mysore is the capital; Bangalore is the British head-quarters and the largest town. The misgovernment of the Hindu dynasty, which the British had restored to Mysore, caused its deposition in 1831. The territory continued under British administration till 1881, when it was handed over to a Hindu Maharajah. Area, 29,440 sq. miles; pop. 5,800,000.

Mysore, the capital of the state of the same name, at an elevation of 2450 feet above sea-level, connected with Bangalore by rail. The fort, separated from the town by an esplanade, is built in the European style. It contains the palace of the Maharajah. Pop. 68,000.

Mysteries (Gr. *mysterion*, from *muo*, to close the lips), among the ancient Greeks, and afterwards also among the Romans, secret religious assemblies which no uninitiated person was permitted to approach. They originated at a very early period, and seem to have had a double object—first, that of handing down the traditions relating to the divinities in whose honour they were celebrated; and secondly, that of teaching and practising religious rites. The most important Greek mysteries were: (1) The Eleusinian Mysteries (q.v.). (2) The Samothracian, celebrated in honour of the Cabiri (q.v.). (3) The Dionysia, which were celebrated in honour of Bacchus or Dionysus. These were of so licentious a character that they were finally forbidden as prejudicial to the public peace and morals. This was likewise done in Italy by a decree of the Roman Senate in 166 B.C. (4) The Orphic, founded by some who called themselves followers of Orpheus. See *Orphism*.—BIBLIOGRAPHY: A. Lang, *Myth, Ritual, and Religion*; L. R. Farnell, *The Cults of the Greek States*.

Mystery Plays. See *Drama*.

Mys'ticism, a word of very vague signification, applied sometimes to views or tendencies in religion which aspire towards a more direct communication between man and his Maker through the inward perception of the mind, than that which is afforded through revelation, or to efforts and inclinations by some special and extraordinary means to hold intercourse with divine powers or the inhabitants of higher worlds. Edward Caird defined mysticism as "religion in its most concentrated and exclusive form". According to John Stuart Mill, "whether in the *Vedas*, in the Platonists, or in the Hegelians, *mysticism* is neither more nor less than ascribing objective existence to the subjective creations of our own faculties, to ideas or feelings of the mind, and believing that, by watching and contemplating these ideas of its own making, it can read in them what takes place in the world without". The tendency towards mysticism seems naturally implanted in some natures, and has been observed in all ages. It is an attitude of mind that appears among all races and at different periods whenever the relation of the soul to the invisible occupies the attention and thoughts of men. It is a characteristic feature of the great Asiatic religions, Brahmanism and Buddhism. In the Neo-Platonic philosophy it is an important element, as represented by Plotinus (A.D. 204–269), Christianity, in consequence of its special tendency to practical good, as well as of its submission to a system of doctrine expressly revealed, would seem to have afforded little scope for the extravagances of mysticism. It soon, however, made its appearance, being intermingled with paganism, and reached its extreme in the writings of the so-called Dionysius the Areopagite. This pseudo-Dionysius obtained an extensive influence, especially through Hugo St. Victor, in the twelfth century, and was everywhere held in high respect until the time of the Reformation. In opposition to scholasticism, which laboured in the construction of a systematic and almost demonstrative theology, this system embodied a theology of feeling and immediate illumination, which attached very little importance to intellectual effort, and laid so much the more weight on purification of heart and ascetic morality. Of the most notable of the German mystics in the Middle Ages were Eckhart (died 1331), and Tauler (died 1361). In the philosophy of the fifteenth and sixteenth centuries, in Paracelsus, Bruno, and others, mysticism took a direction which at a later period gave rise, on the one side, to the alchemists and Rosicrucians, and on the other side to a number of religious sects, of which such men as Jacob Boehme and Swedenborg may be considered the representatives. The Quietism of Madame Guyon and her adherents (such as Fénelon) in France in the eighteenth century was a product of the same nature. Among English mystics we may mention George Fox (1624–91), the founder of the Quakers; the Cambridge Platonists, Cudworth and More, and especially William Law (1686–1771). Among English poets, Wordsworth, Coleridge, Tennyson, and Browning, and, above all, William Blake (1757–1827) were distinctly mystical. Vladimir Solovjov in Russia (1853–90) was a mystic, and the works of Tolstoy are pervaded by a strain of mysticism.—BIBLIOGRAPHY: R. M. Jones, *Studies in Mystical Religion*; F. von Hügel, *The Mystical Element of Religion*; A. B. Sharpe, *Mysticism: its True Nature and Value.*

Mythology. The word myth (Gr. *muthos*) originally simply meant speech, then, in a narrower sense, a tale or tradition, particularly one handed down from prehistoric times giving, in the form of a story about a god or hero, some ancient belief regarding the processes of nature, customs, or problems of cosmogony. Mythology means, in the first place, the whole body of the myths of a particular country, or circling round a particular figure, as when we talk of Greek or Norse mythology; in the second place, mythology is the scientific study of myths, their analysis, and explanation. While mythology deals largely with questions of gods and the origins of things, religion is only one aspect of it. The mythologies of many lands, for example, contain a story of a deluge, but it has not always a religious significance, and is often simply cosmogonic, that is, purely scientific or even historical. The religious view of the Homeric Zeus, as the chief of the immortals who dwelt on Olympus, is very different from the mythological view, which has also to account for the stories of his amours in the form of animals, and many other myths which one is surprised to find in circulation among so cultured a people as the ancient Greeks.

Myths are largely answers to questions propounded by uncivilized man. They ask themselves: Who made the world? Who was the first man? What is the origin of night and day, and the sun and the stars? Who invented fire? What is the origin of this or that custom? How did a certain place get its name? Whence came the mountains and valleys? The answers to these questions constitute the myths of a nation or tribe. The questions asked are in a way scientific ones, and the mythology of primitive man may be said to be his science. While the answers may be quasi-scientific, it must not be forgotten that they may be quite fictitious, due to the mere love of story-telling in the case of an imaginative race. All peoples seem to have speculated on the origin of the world and of man. The Norse story is typical. In the beginning of time there was nothing but chaos and the giant Ymir; then the world was raised out of the sea and the gods came. The gods killed Ymir and created water and sea from his blood, the earth from his flesh, mountains from his bones, the sky from his skull, &c. Similarly in the Indian legend the gods create the world out of the body of a primeval giant Purusha. This myth assumes the eternity of matter. As to the origin of man, we find very widely spread the belief that he is descended from some animal. There is an evolution theory, like the Greek story of the Myrmidons, and a creation theory, like the Greek story mentioned by Pausanias that Prometheus made man by giving life to clay figures. The story of Prometheus stealing fire from heaven is another common story, and is even found in Australia.

Myths explaining the origin of death are universal. Man was at first meant to be immortal. Stories are told to show that death is a punishment for disobedience to a god; sometimes it is unmerited, the result of a curse. Among the myths relating to death, there is a class of stories of almost successful efforts to bring someone back to the land of the living again, as in the story of Baldr, when Hel, the goddess of the living, agreed to restore him if all creatures will weep for him; all do except one old woman (Loki in disguise), and Baldr is lost.

A large class of myth is that which deals with the heroes of a race. Such as the stories of Perseus, Siegfried, Beowulf, &c. Certain features are found to be common to all these hero-legends of different countries. There we find a hero vulnerable only on a particular spot, like the heel of Achilles, or with a particular weapon, as in the case of Baldr. The latter is an interesting case. Baldr in the oldest story is killed by a magic sword called Mistilteinn; which later being interpreted as mistletoe gave rise to the well-known myth. The story of Cupid and Psyche is another common form of hero-myth, exactly parallel to that of Urvasi and Pururavas in the Indian Brahmanas. Very common also are the stories of attempts to avoid a fate or prophecy, as in the case of Œdipus, or the 'Sleeping Beauty'. Another common motif is that of the queen who is said to give birth to animals, which is familiar alike from the *Arabian Nights* and Grimm's *Fairy Tales*. A well-known myth is that of the hero who slays a dragon or other monster which guards a treasure, as in the case of Beowulf and Siegfried, or to save a maiden, as in the case of Perseus. It is possible that this wide-spread tale has its prototype in Vedic mythology, where Indra slays the dragon who has imprisoned the cows. Here the thunderstorm is described in mythological language. The cows are the waters which are released when the clouds are burst by Indra's lightning.

The Chinese story of the deluge is generally recognized to be a memory of an unusually disastrous inundation by the Huang-Ho, which in historic times has frequently done great devastation. The deluge myths of other countries are in many cases of similar origin. The tradition is generally elaborated as it is handed down, its features are exaggerated until they become quite mythical, and in its final form we have a universal catastrophe instead of a local flood. Deluge myths may also be due to primitive scientific curiosity. The story is told to explain the origin of sea and land or of lakes. It also provided the primitive mind with a very rational explanation of the presence of fossils in rocks. The Indian story of the deluge has several curious features. Manu, the first man, is warned by a fish that there will be a flood, and that this fish is destined to save him. He keeps the fish till it grows to a huge size. The flood then comes, and the fish tows Manu about in a boat till the waters begin to subside, when he ties his boat to a mountain-top and descends from it as the water falls. From him all men are descended. The Greek story relates that Zeus determined to destroy all men of the Age of Copper. Warned by Prometheus, his father, Deukalion and his wife Pyrrha made a chest and stocked it with provisions. A heavy rain came, and all men were drowned unless they escaped to the mountain-tops. Deukalion and his wife floated about in the chest for nine days till the flood subsided. Then they prayed to Zeus for children, and he told them to throw stones over their shoulders. Those which Deukalion threw became men, and those which his wife threw became women. As in the Indian story we have here a creation myth, possibly not entirely uninfluenced by a false etymology connecting *laos* (people) with *laas* (stone).

Mythology as a scientific study is by no means modern. Men early began to ask themselves how certain stories of their gods could be reconciled with the respect in which they held them as objects of worship. With the advance of civilization much was seen to be monstrous and irrational in a nation's myths; the stories of the origins of the world seemed absurd or childish. The gods were seen to be mortal in many stories, and addicted to all sorts of vices. At quite an early date rationalistic explanations were given of Greek mythology. The story of the battle of the gods, in which the younger generation, led by Zeus, overthrew the older, was said to be an allegory of the strife of the elements. In the fourth century B.C. Euhemerus propounded his theory that myths were really forgotten history. The gods, he said, were once men whose exploits had been elaborated and glorified in the telling from generation to generation, until they appeared impossible of achievement by mere men. This theory in some ways anticipates that of Herbert Spencer: that the worship of gods arose through the worship of the ghosts of ancestors. It is, however, always possible that stories of men might in time come to be told of gods, and the legends of heroes show figures not yet gods, but more than men.

The scientific study of mythology only became possible in the nineteenth century, when the ancient Egyptian and Assyrian literatures and religions were revealed to the Western world. Still more important for comparative purposes was the opening up of ancient Sanskrit literature, as contained in the hymns of the Rig-Veda, and the prose of the Brahmanas and Puranas. The latter showed that many myths were common to all the Indo-Germanic peoples, and suggested that, like their languages, they might have a common origin. The study of anthropology and folk-lore has carried this comparative study still further, and shown that the same myths are very widely distributed. When we find that in the ancient hymns of the Rig-Veda the god Indra has the strength-giving soma-juice brought to him by an eagle from the highest heaven, that in Greece nectar is brought to Zeus from the west by an eagle, and in Scandinavian mythology Odin in the form of an eagle carries to the gods the mysterious potion which gives wisdom, one may suspect that these stories have all a common origin. The comparative study of mythology received a great impetus from the philological researches of Max Müller, following lines laid down by Kuhn and the brothers Grimm in Germany. The task of mythology, according to Max Müller, is to explain the savage and senseless element in mythology—why a people with such a sense of beauty and moderation in all their artistic conception as the Greeks should relate stories of their gods which would make a Red Indian shudder. He held that comparative mythology, by recovering the original meaning of the name of a god, could explain its original significance. This theory he developed to a great extent, led away by the fact that the earliest Indian mythology is undoubtedly largely nature-poetry, and by many etymological comparisons which have not stood the more rigid tests of later scholarship. The Greek name *Zeus*, for example, and the Germanic *Tiw* have no obvious etymology in Greek or Teutonic, but comparative philology shows they are the same word as the Sanskrit *Dyaus*, which means the sky. Hence we conclude that Zeus is originally the sky, and that all that is told of Zeus was originally told of the sky. Similarly other names were to be traced back to natural phenomena, and all mythology could be explained as descriptions of the sun, dawn, twilight, thunder, &c. Its development was a ‘ disease of language ’; when it was forgotten, for example, that Zeus was the sky, much of the inherited phraseology was no longer understood, and wrong explanations were given of myths. This theory is more true of Indian than of other mythologies. In the Vedas, for example, Indra is the god of the thunderstorm, who slays the demon of drought, and brings refreshing waters to man. Almost all the stories told of him are variants of this theme. Agni is clearly the personification of fire. He is called the ‘ son of strength ’, because of the force necessary to generate him from rubbing the two fire-sticks who are called his parents. In course of time the real meaning of once obvious epithets like ‘ son of strength ’ becomes forgotten, and stories were told to explain its meaning. Similarly we find names originally used as epithets of gods coming to be used as names of gods. Thus, Prajapati, ‘ lord of creatures ’, originally an epithet of Soma, comes to be a distinct deity, a creator. Dhatr (creator), an epithet of Indra, becomes an independent creator of the firmament. We even find the word *Ka* (who) becoming a god, from a misunderstanding of a Vedic hymn with the refrain “ Whom should we worship with our offerings?”

Max Müller’s theory does not allow for the transfer of legends from one deity to another, but the main objection to it is raised by the anthropological school, which points out that the same myths are world-wide, and must therefore be due to primitive man thinking in the same way in different parts of the globe. We may here briefly mention Herbert Spencer’s theory regarding man’s habit of personifying all phenomena. He presupposes a process somewhat the reverse of Max Müller’s. According to him the Vedic hymns to Dawn, for example, are originally addressed to the spirit of a real maiden whose name was Dawn, and there is nothing remarkable in a person in a primitive state of society bearing a name like Dawn or Cloud, &c. In time it was forgotten that there had been a real maiden named Dawn, and the hymns were explained as being addressed to a goddess ‘ Dawn ’. Similarly he would explain the common story of tribes being descended from some animal as a memory of an ancestor who did, as is common among savages, bear the name of an animal. In course of time this ancestor was forgotten, and the tribe said it was descended from a real wolf or whatever the animal was. Ancestor worship he holds to be the earliest form of religion, and nature worship is due to the fact that it was forgotten that Sun and Dawn, &c., were originally the names of ancestors, and not the sun or dawn. This theory has found little acceptance, except in so far as it is generally recognized that ghost or ancestor worship and the belief in spirits does contribute its share to the formation of mythology. It seems unlikely that even the most primitive man, while calling his son Black Bear, should think that his ancestor of the same name really was a black bear. It is unlikely, also, that primitive man had a longer memory than the modern savage—or civilized man for that matter—who does not know who his great-grandfather was.

The folk-lore theory propounded by Tylor, Andrew Lang, and other anthropologists seeks to explain mythology by reasoning from the lower status of civilization to the higher. Just as comparative philology showed that much was common to the mythology of the Indo-Germanic nations, for example, so folk-lore has shown that the same myth is found among widely separated peoples, and it is argued that primitive man thinks in the same way all the world over. This theory explains the savage element in the mythology of a civilized race as a survival from the beliefs of more primitive ancestors. In Greece, for example, we find human sacrifices and the worship of stones surviving long into historic times. These are features which can be paralleled among all primitive peoples, and are to be explained as survivals from more barbaric times. All the irrational elements in mythology are relics of a stage of society when they seemed quite reasonable to the child-like mind of primitive man. The changing of men into animals, for example, which is common in myths, is accepted as quite reasonable by the savage mind, as it is by a child on hearing a fairy story. Investigation of the mythologies of primitive tribes of the present day seems to show that they are puzzled by the same questions as are answered in older mythologies, and explain them in much the same way. It is important, however, to remember, as Max Müller emphasized, that primitive man neither thinks like a civilized man nor thinks what we suppose he ought to have thought. He endows all natural phenomena with personalities. Civilized man may think it difficult to imagine the wind as a person, for example, yet Boreas is prominent in Greek mythology, and he can be parallelled in other countries. Primitive man naturally thinks of all the forces of nature as endowed with personality, and as many of these forces are superhuman, he thinks of them as gods. It must be remembered, however, that he can only think of them as savages like himself, and therefore their adventures and manners are savage. Other myth-making factors among savage tribes are the belief in spirits of the dead and intercourse with them—by medicine-men at least—and belief in magic. The folk-lore explanation is not in itself sufficient. It does not explain everything in mythology. For one thing, much mythology must be due to sheer fancy—to the love of the primitive man for stories. It takes too little note of the philological side of the question. Max Müller is right in saying that many myths are due to a disease of language, and owe their origin to false etymologies. To take as an example the well-known Greek myth of the origin of the Myrmidons. According to this, Zeus transformed ants into men to people Thessaly for his son Æacus to rule over. The philologist says this story owes its origin to an etymology which connects *Murmidones* with *murmēkes*, ants. The anthropologist says the story of the descent from ants only means that the ant was the totem of the Myrmidons, and quotes numerous parallels, or he may say it is a common creation myth, and quote the parallel of the Bushman's god who peopled the earth by turning snakes into men. According to the theory expounded by Sir J. G. Frazer in *The Golden Bough*, magic is the source of religion and mythology, particularly magic intended to produce rich crops and numerous herds. In all parts of the earth magic rites are practised to stimulate the growth of crops, and Frazer's theory is that out of the representatives in these rites of the spirit of corn, of summer, &c., there have developed the gods with myths explaining the rites. While it is true that the magic is a source of mythology, it seems impossible to prove that all mythical beings were vegetation spirits in their origin. This theory tends to the multiplication of examples in which superficial similarities are noticed, and serious differences not noted. The greatest care must be exercised in explaining a myth of a civilized race like the ancient Greeks from a custom of present-day savages. It may not be true that primitive or savage man is the same everywhere and in all time. If he were it is difficult to account for the widely differing characteristic traits of the nations. So far no completely satisfactory explanation of mythology has been propounded. The philologist must contribute his share and so must the anthropologist. Neither should forget that imagination and the mere love of story-telling will play its part in the formation of myths. The fundamental question, however, why—as distinct from how—does man invent such stories? is like the problem of the origin of religion, one not for the philologist or anthropologist, but for the philosopher.—BIBLIOGRAPHY: G. W. Cox, *Mythology of the Aryan Nations*; F. Max Müller, *Contributions to the Science of Mythology*; *Anthropological Religion*; *The Science of Religion*; Herbert Spencer, *Principles of Sociology*; E. B. Tylor, *Primitive Culture*; Andrew Lang, *Custom and Myth*; *The Making of Religion*; *Myth, Ritual, and Religion*; Sir J. G. Frazer, *The Golden Bough*; W. Mannhardt, *Mythologische Forschungen*.

Mýto Vysoké, a district and town of Bohemia, Czecho-Slovakia. Pop. of district, 45,000; town, about 10,000.

Myxin'idæ, the name applied to the hag-fishes, one of the two families included in the class Cyclostomata of the Vertebrata. The best-known species is the common or glutinous hag (*Myxīnē glutinōsa*), which eats its way into various fishes. See *Hag*.

Myxomycetes (mix-o-mī-se'tēz), or **Mycetozo'a**, an order of Fungi (sometimes claimed as Protozoa), growing in moist situations on various substances, such as decaying leaves or rotten wood, over which they spread in the form of a network of naked protoplasmic filaments of a soft creamy consistence, and usually of a yellow colour. The spore-cases are often highly coloured.

N

N, the fourteenth letter and eleventh consonant of the English alphabet. It is classed as a nasal, a lingual, and liquid or semi-vowel. In English and most other languages *n* has a pure nasal sound; in French and Portuguese, after a vowel in the same syllable, as *on*, *un*, *&c.*, it has the effect of giving a semi-nasal sound to the vowel preceding. At the end of words after *m*, as in *hymn*, or *solemn*, it is mute. The Spanish alphabet has a character *ñ*, called *n* with the *tilde*, as in *España*, pronounced like *ni* in *onion*, *minion*; *gn* in Italian is pronounced in the same way.

Naas, a town of County Kildare, Ireland, on the Great Southern & Western Railway and the Grand Canal, about 20 miles from Dublin. Naas was an ancient borough, and had its sovereign and corporation. Near by is Punchestown race-course, famous for its steeplechases. Pop. about 4000.

Nabathæ'ans, a Semitic people who from the fourth century B.C. to about A.D. 100 held a position of importance in Arabia Petræa and the adjacent regions. They were ruled by kings; their capital was Sela (later Petra), and they carried on a great caravan trade.

Nabeul, a city of Tunisia, on the north-eastern seaboard, famous for its essences. Oranges, lemons, and flowers are grown in the vicinity for the European markets. Pop. about 11,500.

Nábha (näb'ha), one of the Punjab native states, India, having an area of 863 sq. miles, with a population of 248,890. The chief town is Nábha, which has a pop. of 18,500.

Nablus, ancient **Shechem**, a town of Palestine, capital of Samaria, 30 miles north of Jerusalem. It is beautifully situated among gardens, orchards, and fertile fields, along the base of Mount Gerizim. It is the principal residence of the descendants of the ancient Samaritans, and has some manufactures and a considerable trade. The chief objects of attraction to pilgrims are the tombs of Joshua and Joseph, and Jacob's Well, near Gerizim. The town, which was fortified by the Turks during the European War, was taken by Lord Allenby in Sept., 1918. Pop. estimated at 25,000.

Nacelle, in aeronautics, the cabin or accommodation for crew and passengers, as opposed to the fuselage, &c. The word, taken literally, means *skiff* (i.e. Lat. *navicella*, diminutive of *navis*, ship).

Nachtigal (nȧ*h*'ti-gȧl), Gustav, German explorer, born in 1834, died in 1885 off Cape Palmas. In 1869 he was commissioned by the King of Prussia to carry some gifts to the Sultan of Bornu. He journeyed to Kuka, the capital of Bornu, by way of Fezzan and Tibesti, visited Borgu and Bagirmi, returning by way of Wadai, Darfur, and Kordofan, and finally reaching Khartoum towards the end of 1874. This journey is described in his *Sahara und Sudan* (3 vols., 1879–89). He was afterwards Consul-General at Tunis, remaining there till 1884, when he was sent to the west coast of Africa, and took possession of Togoland for Germany.

Nadir Shah, King of Persia, a famous conqueror and usurper, was born in 1688, assassinated in 1747. Having distinguished himself against the Afghans and Turks, he acquired the chief power in Persia in 1732, seized the shah, confined and deposed him, and proclaiming his son Abbas, then an infant, in his stead, assumed the title of regent. The young king dying in 1736, he seated himself on the throne as shah. Being invited by some conspirators about the person of the Great Mogul to undertake the conquest of India, he began his march at the head of 120,000 men, and with little resistance reached Delhi in March, 1739. Being exasperated by some tumults on the part of the inhabitants, he caused a general massacre, in which upwards of 100,000 persons perished. After this barbarity the victor concluded a peace with the Mogul, whose daughter he married, receiving with her, as a dowry, some of the finest provinces of his empire contiguous to Persia. His dominions subsequently stretched from the Indus and the Oxus to the Euphrates and the Caspian. A conspiracy, however, was formed against him, and he was assassinated in his tent, his nephew, Ali Kuli, succeeding to the throne.

Nadiyá, or **Nudia**, a district and town of Bengal, India. The Padma or Ganges flows along its north-eastern boundary. The chief town is Nadiyá, on the Bhagirathi. Area of district, 2790 sq. miles; pop. of district, 1,618,000; of town, 13,000.

Nævius, Gnæus, an early Roman poet, born in Campania between 274 and 264 B.C., died 204 or 202 B.C. He wrote tragedies and comedies after the model of the Greek, and an epic poem upon the Punic War. By the introduction of some of the Roman nobility into his comedies he provoked their anger, was banished from the city, and retired to Utica. Fragments only of his works have come down to us.

Nævus, or **'Mother's Mark'**, a disfigurement which occurs most frequently on the head and trunk, but may also appear on the extremities. It consists essentially of an enlargement of the minute veins, or venous capillaries, which are dilated, and anastomose or unite among themselves to form a vascular patch generally of a deep-red colour. The familiar name of ' mother's mark ', or ' longing mark ', is applied from the popular belief that the disfigurement was the result of fear, fright, unnatural longing, or some such irritation acting upon the mother's constitution, and communicating its effects to the unborn child in the shape of this mark.

Naga Hills, a district of Assam. It consists largely of unexplored mountain and jungle inhabited by the Naga tribe. Area, 3070 sq. miles; pop. 150,000.

Nagasa'ki, a seaport and seventh city of Japan, on Kyushu, in a natural harbour 3 miles from open sea. It is connected by rail and sea with other Japanese centres, and contains the shipbuilding-yards of the Mitsubishi Company, constructors for the Japanese navy. There are extensive ironworks; coal is mined near by. Pop. (1920), 176,554.

Nagoya, the fifth city of Japan, on Honshu, connected by rail with Tokyo and Osaka, from which it is about equidistant. It contains one of the greatest Shinto shrines of Japan. Pop. (1920), 429,990.

Nágpur, or **Nagpore**, a town in India, capital of the Central Provinces, and of the division of Nagpur (area 23,520 sq. miles; pop. 3,110,000), 440 miles E.N.E. of Bombay, with which and with Calcutta it is connected by railway. The municipal area includes Sitabaldi Hill and Sitabaldi suburb, where the British Residency, Government offices, cantonments, &c., are situated. The manufactures include cotton and woollen cloths, and utensils of copper, brass, &c. There is a large trade, more especially in cotton. There are important educational institutions, libraries, printing-presses, and some handsome Hindu temples. Nagpur was formerly the seat of a line of rajahs which became extinct in 1853, when their territory was annexed to the British dominions. Pop. 101,500.

Nahuel-Huapi, or **Tiger Lake**, a lake of Argentina, in the territory of Neuquén, in the Andes. It is the source of the River Limay and the boundary of the territories of Neuquén and Rio Negro. Altitude, 2000 feet; area, 110 sq. miles.

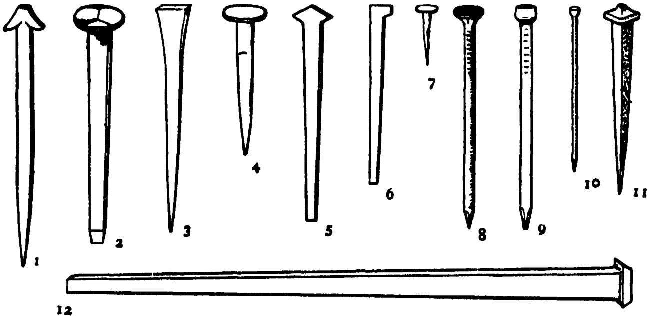
Nahum, one of the twelve minor prophets, the author of a book of prophecies included in the Old Testament. His prophecies relate to the destruction of Nineveh, which he describes in vivid colours. The period in which he lived is, however, uncertain, probably 700–600 B.C.

Na'iadæ, a natural order of monocotyledons, consisting of plants living in fresh or salt water in most parts of the world, having inconspicuous hermaphrodite or unisexual flowers. *Zostera marina* (the grass-wrack) is the most familiar example.

Naïd'idæ, or **Naidomorpha**, a family or group of small water-worms, some of them of common occurrence in the mud of ponds and streams. They multiply by tranverse division (fission) as well as sexually.

Nails (of Animals), like hairs, are appendages which belong to the category of the exoskeletal elements of the animal frame, or are parts of the skin, of the outer layer of which they are modified appendages. A nail, in fact, is a specialized arrangement of the cells of the epidermis. In man the nails do not enclose the ends of the digits; but in the horse, and 'hoofed' or ungulate quadrupeds generally, the nails assume the form of protective coverings to the digits, and are then known as 'hoofs'. Nails may be produced to form 'claws', as in birds and carnivorous mammals, while in the sloths they assume a large relative size, and are used as a means of arboreal progression. In the Amphibia—as in some toads, efts, &c.—the nails appear as mere thickenings of the skin at the extremities of the digits. The nails appear about the fifth month of fœtal or embryonic life.

Nails are of many different lengths and shapes. *Brads* used for nailing floors and ceilings have the head only on one side; the small sharp nails with round flat heads, used by saddlers and upholsterers, are called *tacks*; the small sharp taper nails without heads, used by shoemakers, are called *sprigs*; a variety in which the head is large and the spike small has the name *hobnails*; very large nails are called *spikes*. In early days every kind of nail was produced by hand labour alone, each nail being separately forged from a thin rod of iron. In 1810 a machine was contrived by which nails could be cut from an iron sheet and headed at one operation, at the rate of 100 per minute. Since that time great improvements have been made in nail-making machinery, and the method commonly adopted is to cut nails out of sheet iron of the required thickness, an operation which, by the improved processes, is carried on with great rapidity. The quantity produced in this way is astounding, some mills turning out at the rate of 10 miles of nail-rods an hour.



Various Common Forms of Nails

1, Clasp. 2, Rose. 3, Horseshoe. 4, Clout. 5, Clasp. 6, Brad. 7, Tack. 8, French. 9, American. 10, Panel Pin. 11, Wall Nail. 12, Spike.

1, 2, 3, 4, and 12 are wrought; 5, 6, and 7 are cut; 8, 9, and 10 are wire; and 11 is cast.

Nain, an ancient village of Galilee, 8 miles south-east of Nazareth, at the foot of Mount Hermon, celebrated as the scene of the raising of the widow's son (*Luke*, vii, 11).

Naini Tal, a hill-station and district in the Kumaon division of the United Provinces, India. The town is on the banks of a small lake at an altitude of 6409 feet, among the spurs of the Himálaya. It is reached by road from the railway terminus at Holdwani, and is the hot season head-quarters of the administration of the United Provinces. The district is not greatly cultivated. District area, 2721 sq. miles; pop. 824,000; town pop. 9750.

Nairn, a maritime county in the north-east of Scotland, on the Moray Firth, served by the Highland Railway. The south part of the county is hilly (Carn Glas, 2162 feet). The principal rivers are the Findhorn and the Nairn. Agriculture and sheep-farming are the principal occupations. Nairn is the county town; Cawdor and Kilravock with their castles are of historical interest.

Nairn was included in Moray district in ancient Scotland, and in 1891 detached portions of the county were absorbed by Ross, Inverness, and Moray. Area, 162 sq. miles; pop. (1921), 8790.

Nairn, the county town of above county, is a royal burgh, seaport, and watering-place near the mouth of the River Nairn and on the Highland Railway. Its harbour is accessible only to small vessels. Fishing is important. Nairn, then Invernairn, became a royal burgh in the twelfth century. Pop. 4700.

Nairne, Caroline Oliphant, Baroness, Scottish poet, belonging to the Oliphants of Gask, born in 1766, died in 1845. She married William Murray Nairne, who in 1824 became Baron Nairne. She was the authoress of some exceedingly popular songs, including *The Laird o' Cockpen*, *The Land o' the Leal*, and *The Auld Hoose.*

Nairobi, the capital and administrative headquarters of Kenya Colony, on a plateau (altitude, 5450 feet). It is on the Uganda Railway. Pop. 14,000 (including 800 Europeans and 3000 Indians). In the Nairobi district there are about 50,000 to 60,000 natives and 400 Europeans. The Thika Railway runs from Nairobi to Fort Hall, and by extension to Mount Kenya. Along this line a papyrus swamp subsided (April, 1922), carrying away main road and railway bridges, and cutting off Nairobi from Kenya Province by the creation of a new valley and a rushing river 60 feet in depth.

Nairs, a Hindu people of South-West India, belonging to the Sudra caste, most numerous in Malabar and Travancore, where they were formerly dominant. They retain matrilineal customs, following the rule of female descent; and a man's heirs are not his own, but his sister's children. Polyandry was also formerly a recognized institution, but is now dying out.

Naivasha, an inland province of Kenya Colony, extending between Lake Rudolf and the Tanganyika frontier. It is mountainous in the central regions, and contains Lakes Naivasha, Elmenteita, and Nakura. The Uganda Railway traverses the province. Naivasha, east of the lake and on the railway, is the provincial capital. Around Nakura agriculture is extensively practised. The estimated pop. is 140,000 (about 2000 Europeans).

Naja, a genus of venomous snakes. The best-known examples are *N. tripudians*, the cobra de capello of India, and the *N. haje* of Africa, which is tamed by native jugglers, and is identified by many writers with the asp employed by Cleopatra to bring about her death. The king cobra (*N. bungarus*), which feeds on other snakes, ranges from India to the Philippines. Other closely related forms are: the Indian krait (*Bungarus cœruleus*), the Australian black snake (*Pseudechis porphyraceus*), tiger snake (*Notechis scutatus*), and death adder (*Acanthophis antarcticus*), and the coral snake (*Elaps corallinus*) of tropical America and the West Indies. See *Cobra*; *Asp.*

Nakhichevan (ná-*h*ich'e-ván), is the name of two towns in Russia. The first is situated on the right bank of the Don, in the government of Ekaterinoslav, 7 miles east of Rostov. Pop. 54,000.—(2) A town in the government of Erivan, in Transcaucasia, 175 miles south of Tiflis, regularly and substantially built. An Armenian tradition says Noah was its founder, and a mound of earth is still pointed out as his grave. Pop. 9000.

Namaq'uas, the European name for the Hottentot tribes inhabiting the Namaqualand district. See *Hottentots.*

Names, Personal. It is probable that at first all names were significant. Old Testament names are almost all original, that is, given in the first instance to the individual bearing them, and either originated in some circumstance of birth or expressed some religious sentiment, thus—Jacob (supplanter), Isaiah (salvation of Jehovah), Hannah (favour), Deborah (bee), &c. Neither the Hebrews, Egyptians, Assyrians, Babylonians, Persians, nor Greeks had surnames; and in the earliest period of their history the same may be said of the Romans. In course of time, however, every Roman citizen had three, the *prænomen* or personal name, the *nomen* or name of the gens or clan, lastly, the *cognomen* or family name, as Publius Cornelius Scipio. Conquerors were occasionally complimented by the addition of a fourth name or *agnomen*, commemorative of their conquests, as Publius Cornelius Scipio *Africanus.* Greek names refer to the personal appearance or character; and were often supplemented by the occupation, place of birth, or a nickname. Times of great public excitement have had a very considerable influence in modifying the fashion in names. It is impossible to state with any degree of certainty when the modern system of personal nomenclature became general. Surnames were introduced by the Norman adventurers, but were for centuries confined to the upper classes. They became general in Scotland about the twelfth century. In some of the wilder districts of Wales they can hardly be said to have been adopted even yet. The principal sources from which surnames are derived are personal characteristics (Black, Long, Short), rank, profession, or occupation (Bishop, Knight, Miller), localities, or natural objects (Hill, Dale, Stone), and patronymics (Johnson, Wilson, Andrews). The Hebrews had no surnames proper, but to distinguish two men of the same name they used the form Solomon ben David (Solomon son of David). The Welsh use the word ap in the same way; Evan ap Richard (John son of Richard = Prichard). In Britain and most Continental nations the wife changes her surname on marriage to that of her husband; in Spain, however, she retains it, while the son may adopt either the paternal or maternal name. In Great Britain a man may now change his Christian name and surname without an Act of Parliament, royal licence, or even public advertisement; but there is no law to compel third parties to use the new name.

Namur, a southern province of Belgium, on the French frontier, traversed by the Meuse and Sambre and by the combined streams (Maas). The surface is generally hilly and afforested in the south-east. The north is the agricultural area; the industrial area is the Sambre Valley. Namur is the capital. Area, 1414 sq. miles; pop. (1920), 352,519.

Namur (Fl. *Namen*), a town of Belgium, capital of the province of Namur; a railway junction at the confluence of the Sambre and Meuse. The cathedral of St. Aubin (1751–67) contains the heart of Don John of Austria (died 1578), the conqueror of Lepanto. There are several museums, and the church of St. Loup (1621–53), built in the baroque style, is interesting.

Namur was the capital of a countship that fell to Burgundy in 1420. It has been an episcopal see since 1559. It was invested by the French under Vauban (1692) and by William III (1695), and a circle of nine detached forts (350 guns) was constructed by Brialmont in 1888 as a link in the Meuse Valley defences. On 19th Aug., 1914 (European War), forces of Bülow's Second Army (German) appeared before Namur, and the town was besieged by General Gallwitz. The bombardment began on 21st Aug., 1914, and with the retreat of de Lanrezac from the Sambre, on the 23rd, the Belgian field troops retired and Namur fell. The Germans lost 12,000 men in the attack, and subsequently gave the town over to a reign of terror. Pop. (1920), 31,681. See *European War.*

Nanaimo, a seaport-town of Vancouver Island, Canada. It is 73 miles from Victoria, and is served by a branch of the Canadian Pacific (Esquimault and Nanaimo) Railway. Coal is exported from the neighbouring mines, chiefly to San Francisco. Pop. 8300.

Nana Sahib, the infamous leader of the sepoys in the Indian Mutiny. He was born in 1825, and adopted by the ruler of the state of Bithoor. On the death of the latter the British refused to recognize Nana as his successor. In May, 1857, Nana placed himself at the head of the mutineers at Cawnpore. The Europeans there capitulated on a promise that they should be sent away in safety. But the men were shot down and the women and children massacred. (See *Cawnpore.*) Nana was defeated by Sir H. Havelock, and was driven across the frontier into Nepál, and there all knowledge of him ceases.—Cf. J. Burgess, *The Chronology of Modern India.*

Nancowry, an island of the Nicobars (q.v.), in the central group of four, the others being Camorta, Trinkat, and Katchall. There is a Government agency at Nancowry (Camorta), but the island is chiefly famous for its magnificent landlocked harbour. A British penal settlement was maintained on the island for nineteen years, but was abandoned in 1888. The Nancowry group was for long the seat of a gang of Kanaka pirates under one, Worthington, a deserter from the British navy, whose policy was to wait until a vessel entered Nancowry, board her as a trader or inhabitant, and in due course to murder the whole crew, and to plunder and scuttle the ship. They were never suspected until their vigilance was somewhat relaxed on the retirement of Worthington from business.

Nancy, a city of France, capital of the department of Meurthe-et-Moselle, on the Meurthe. The church of Notre Dame, and the cathedral (1742), were erected by Stanislas Leszczinski, King of Poland, who became duc de Lorraine on his abdication in 1736, and there is an old ducal palace. Nancy was until 1870 the capital of Lorraine. The university was founded in 1572. The town is famous for its cambric and embroideries. Muslin, iron, cottons, and woollens are manufactured. Pop. 120,000.

At Nancy (1477) was fought the great battle between the Swiss under Réné, duc de Lorraine, and Charles the Bold of Burgundy, who was defeated and slain. During the European War the battle of Nancy was fought between the French and Germans (25th Aug. to 12th Sept., 1914). After the defeat at Morhange (q.v.) Castelnau and Dubail (Second and First Armies) fell back upon the gap of Charmes, and a terrific battle ensued until 9th Sept., when the exhausted German armies received a truce to bury their dead. On 12th Sept. a general German retreat began, and on the 16th the victorious French 16th Corps entered Lunéville.

Nanda Devi, a peak of the Himálaya, in the north of the United Provinces of India; altitude, 25,665 feet.

Nandgaon, a feudatory state of the Central Provinces, India. Wheat, cotton, and rice are produced. Raj Nandgaon, on the Nagpur-Raipur Railway line, is the capital. Area, 870 sq. miles; pop. about 167,000.

Nanking ('southern capital', as opposed to Peking, 'northern capital'), a city of China, capital of the province of Kiangsu, on the Yangtse-kiang, which is navigable at all seasons to Nanking. It is surrounded by a wall generally above 40 feet high. Nanking gives its name to nankeen cloth. There is an arsenal, mint, and small-arms factory; a university, naval college, and agricultural experiment station. Connection by railway is afforded with Shanghai and Pukow, for the Tientsin-Pukow Railway. It was at one time the capital of the Chinese Empire; but the seat of government was transferred to Peking in 1403. It was at Nanking that the Chinese-British treaty was signed in 1842. The city was held from the spring of 1853 to July, 1864, by the Taipings, who made it their capital. The famous porcelain tower of nine stories and 200 feet in height, completed in 1432, was destroyed during the Taiping rebellion. Pop. estimated at 400,000 to 500,000.

Nansen, Fridtjof, Norwegian explorer, born in 1861, studied at Christiania University, and in 1882 made an Arctic voyage in a sealing-vessel. In 1888 he crossed Greenland a little north of latitude 64°, as told in his *Across Greenland* (1890). In 1893 he sailed on board a specially built steamer (the *Fram*), expecting that, entering the Polar ice near the New Siberian Islands, he would be drifted by a current over the Pole to Greenland. After being carried so far he left the *Fram*, and with a single companion, and with sledges, dogs, and kayaks, took the ice. In this way he reached the highest latitude till then attained, 86° 14′ (April, 1895), and next proceeded to Franz Josef Land, where he spent the winter of 1895–6 and met Frederick Jackson, leader of an expedition sent from England, with whom he returned, followed soon after by the *Fram*. This great journey he described in his *Farthest North* (1897). He was professor of zoology at Christiania, and Norwegian Minister in London, 1906 to 1908. He was High-Commissioner for the Russian Famine Relief in 1921, and published reports on the situation.—Cf. F. Dolman, *Dr. Nansen: the Man and his Work.*

Nantes (năṇt), a seaport-city of France, capital of the department of Loire-Inférieure, on several islands formed by the Loire, 35 miles from its mouth. The principal buildings are the castle of the ducs de Bretagne, where the Edict of Nantes (q.v.) was signed, and the cathedral (1434). A serious fire occurred in the castle in 1921. Nantes is a shipbuilding centre, and ships reach the town by ship canal (27 miles) from St. Nazaire. There are chemical-, machinery-, glass-, and soap-factories. Pop. 170,500.

Before the Roman conquest of Gaul Nantes was the capital of the Gallic tribe of the Namnetes. In 1499 it passed from the ducs de Bretagne by the marriage of Anne of Brittany with Louis XII of France. John Knox was a galley slave at Nantes (1547–9), and Jules Verne was born in the town (1828). During the Revolution Carrier organized at Nantes the wholesale massacres known as the *noyades* or 'republican marriages'.

Nantes, Edict of, was signed by Henri IV in that city, 30th April, 1598. It allowed the Protestants the free exercise of their religion, and threw open to them all offices of State. This edict was formally revoked by Louis XIV on 20th Oct., 1685. As a consequence of this fatal act for France about 400,000 Protestants, forming the most intelligent and industrious section of the people, emigrated to Britain, Holland, and other Protestant countries, much to the benefit of their adopted homes.

Nantuck'et, an island of Massachusetts, 18 miles south of Cape Cod, 15 miles long, and from 3 to 4 miles wide. Agriculture and pisciculture are the staple industries. The town of Nantucket is situated on the north side of the island, and is the county seat of Nantucket county, comprising the island proper and adjacent islands. Pop. 2962.

Nant'wich, a market town of Cheshire, England, on the Weaver, 4 miles from Crewe; served by the Great Western and the London & North-Western Railways. The cruciform church of St. Mary and St. Nicholas is the principal attraction. Nantwich was once famous for its salt-works, but at present its staple manufacture is boots and shoes. Pop. 7296.

Nap, a card game which at one time was referred to as Napoleon, after whom the game is called, because the chief player in it becomes for the time an Ishmaelite whose 'hand' is against every man's. It is a good game for three, four, or five players, the only requirements being an ordinary pack of cards, a little intelligence, and some coppers. Each player receives five cards, dealt singly round the table—or its substitute. In turn calls are made of the number of tricks each thinks he can make if he is permitted to lead the first card and settle which suit is 'trump' by leading it. A certain sum changes hands for each value of call, the direction of passage being determined by the success or failure of the caller.

Naph'tali (Heb., 'my wrestling'), the sixth son of Jacob, and the head of one of the twelve tribes. The tribe had its full share in repelling the incursions of the Canaanites during the first centuries of the conquest, but disappears from history when Tiglath-pileser overran the north of Israel and bore away the whole of the population to Assyria. Under the title of Galilee the district occupied by the tribe became in New Testament times more famous than it had ever been before.

Naphtha, a term applied to liquid hydrocarbons of low boiling-point obtained in the fractional distillation of petroleum, shale-oil, and coal-tar. They are all highly inflammable liquids, which are used for burning purposes, as a source of fuel in internal-combustion engines, and as solvents for fats, resins, india-rubber, &c. Mineral or petroleum naphtha consists mainly of paraffins and naphthenes, and is obtained chiefly from the Caspian Sea district, Roumania, the United States, Persia, Burmah, and other countries. The naphtha from shale-oil contains olefines as well as paraffins, whilst coal-tar naphtha consists mainly of xylene and other hydrocarbons of the benzene series. Wood naphtha or wood spirit is the crude spirit obtained by the distillation of wood, and consists chiefly of methyl alcohol and acetone. It is used as a solvent, and also for denaturing alcohol to be sold as methylated spirit.

Naphthalene is a crystalline hydrocarbon with an odour of coal-gas, and is occasionally deposited in gas-pipes in cold weather. It has the formula $C_{10}H_8$, and is commonly obtained by subjecting certain carbon compounds to high temperatures, e.g. when marsh-gas or the vapours of alcohol, ether, or benzene are passed through a red-hot tube. It is a constituent of all coal-tars, the usual amount being 4 to 6 per cent. It is prepared by distilling the tar, collecting the oil which passes over between 210° and 240° C. This is known as carbolic oil, and as it cools deposits solid naphthalene, which is purified by filtration, subsequent pressing, and treatment with various chemical reagents, e.g. dilute caustic soda, sulphuric acid, and ultimately sublimed. Naphthalene gives rise to numerous derivatives, which resemble those of benzene. They are largely used in the manufacture of dyes. Among its derivatives are the naphthylamines which correspond with aniline, and the naphthols which correspond with phenol.

Naphthyl, or Dinaphthyl, $C_{20}H_{14}$, a hydrocarbon obtained, together with other products, by heating naphthalene with a mixture of manganese dioxide and sulphuric acid diluted with twice its weight of water.

Napier, Admiral Sir Charles, British naval commander, cousin of Sir Charles James and Sir William Napier, was born in 1786, died in 1860. He entered the navy as midshipman in 1799, was promoted lieutenant in 1805, and sent to the West Indies, where he served in the operations against the French. He was promoted commander by Admiral Cochrane in Aug., 1809, and in 1811 was employed in Portugal and along the coast of Southern Italy. In 1813 he was attached to the North American squadron, and in August of the following year he led the expedition up the Potomac River. At the conclusion of the war he was made a C.B. In 1833 he accepted the command of the Portuguese Constitutional fleet, and effected the establishment of Donna Maria on the throne. Returning to England, he was appointed in 1839 to the command of the *Powerful*, and ordered to the Mediterranean, where, on the outbreak of the war between Mehemet Ali and the Porte, and the co-operation of Britain with Russia and Austria on behalf of the latter power, Sir Charles Napier performed some of his most gallant exploits, including the storming of Sidon and the capture of Acre. Having blockaded Alexandria, he concluded on his own responsibility a convention with Mehemet Ali, by which the latter and his family were guaranteed in the hereditary sovereignty of Egypt on resigning all claim to Syria. On his return to England he was created K.C.B. In 1841 he was elected member for Marylebone. In 1847 he received the command of the Channel fleet as rear-admiral; and in 1854, on the commencement of the Russian War, he was nominated to the command of the Baltic fleet, being now a rear-admiral. In this capacity he accomplished little beyond the capture of Bomarsund. He sat in Parliament as member for Southwark from 1855 till his death. He published a series of *Letters to Lord Melville on the State of the Navy*, an *Account of the War in Portugal and of the War in Syria*, and numerous contributions to the *United Service Magazine.*—Cf. General Elers Napier, *The Life and Correspondence of Admiral Sir Charles Napier.*

Napier (nā'pi-ėr), Sir Charles James, British soldier and administrator, born in 1782, died in 1853. He entered the army in 1794, served in Ireland and Portugal, was wounded at Coruña, and taken prisoner in 1809. In 1811, when again at liberty, he returned to the Peninsula, and served through the war. He missed the battle of Waterloo, which took place three days before he reached the scene of action. In 1837 he was made major-general; in 1838 K.C.B. In 1841 he was appointed to the chief command in the Presidency of Bombay, with the rank of major-general, and was shortly afterwards called to Scinde. Here he gained the splendid victories of Meanee and Hyderabad, and was afterwards made Governor of Scinde, which he administered till 1847. He had quarrelled with the directors of the East India Company, but during a panic caused by the want of anticipated success in the war with the Sikhs in 1849 his services were again required, and he sailed once more for the East, as commander-in-chief of all the forces in India. Before he arrived Lord Gough had brought the Sikh War to a triumphant termination, and no special work remained for Sir Charles Napier to perform.—Cf. W. N. Bruce, *Life of General Sir Charles Napier*.

Napier, John, Laird of Merchiston, near Edinburgh, the inventor of logarithms, was born 1550, died 1617. He was educated at St. Andrews, travelled on the Continent, and ultimately settled down at the family seats of Merchiston, near Edinburgh, and Gartness, in Stirlingshire, as a recluse student. In 1614 he published his book of logarithms (*Logarithmorum Canonis Descriptio*; Edinburgh, 4to). The invention was very soon known over all Europe, and was everywhere hailed with admiration by men of science. Napier followed it up, in 1617, by publishing a small treatise, giving an account of a method of performing the operations of multiplication and division by means of a number of small rods. These materials for calculation maintained for many years a place in science, and are known as Napier's Bones.

Napier, Robert Cornelius, Baron Napier of Magdala, born in Ceylon 6th Dec., 1810, and died in 1890. He entered the Royal Engineers in 1826, and served in the Sutlej campaign in 1845–6, where he was severely wounded. In 1848–9 he served in the Punjab, and was chief engineer at the siege of Multan. He was chief of staff to Sir J. Outram in 1857, and was prominent in the relief of Lucknow at the beginning of the Indian Mutiny. In the Chinese War of 1860 he commanded a division with the local rank of major-general. In Oct., 1867, he was entrusted with the command of the Abyssinian expedition, and captured Magdala, 13th April, 1868. He was then made Baron Magdala and G.C.B. In 1870 he was made commander-in-chief in India, with the rank of general, became Governor of Gibraltar in 1876, was made field-marshal in 1883, and Constable of the Tower in 1887.

Napier, Sir William Francis Patrick, British soldier, brother of Sir Charles James Napier, the conqueror of Scinde, was born in 1785, died in 1860. At the age of fourteen he entered the army, served at the siege of Copenhagen, and with his brothers Charles and George took a distinguished part in the Peninsular campaigns, became lieutenant-colonel in 1813, and colonel in 1830. Some years after the conclusion of peace he commenced his celebrated *History of the Peninsular War*, the publication of which began in 1828, and extended over the intermediate period till 1840. In 1841 Colonel Napier was advanced to the rank of major-general; he was appointed Lieutenant-Governor of Guernsey the following year, and in 1848 created a K.C.B. He also wrote: *History of the Conquest of Scinde*, *History of the Administration of Scinde*, and a *Life of Sir Charles James Napier*.

Napier (nā'pi-ėr), a seaport-town of North Island, New Zealand, exporting much wool and mutton from the adjacent grazing-lands. It has railway and steamer communication with Wellington and Auckland. Pop. (1920), 16,883.

Naples (nā'plz; It. *Nap'oli*), a maritime province of Campania, Italy, on the Tyrrhenian Sea. It includes the Islands of Capri, Procida, and Ischia. Generally it is mountainous (Vesuvius, 4000 feet), but is fertile in the north. Area, 351 sq. miles; pop. (1915 estimate), 1,360,824.

Naples (It. *Napoli*), the largest city of Italy, in Campania, capital of the province of Naples. It is situated on the northern shore of the beautiful Bay of Naples, about 160 miles from Rome. Its site is magnificent, being on the side of a nearly semicircular bay, partly along the shore, and partly climbing the adjacent slopes, bounded on the one side by the picturesque heights of Posilipo, and on the other by the lofty mass of Vesuvius. The city is divided into two unequal parts by a steep ridge proceeding from the height on which stands the castle of St. Elmo, and terminated by a rocky islet surmounted by the Castello dell' Ovo. The largest and most ancient part of Naples, to the east of these heights, now forms the business quarter. The western and more modern part of the city is the fashionable quarter. There are few remains of historical or antiquarian interest, but there are two castles, Castello dell' Ovo and Castello Sant' Elmo, and four gates of mediæval construction. The cathedral dates from 1272. It was erected on the site of two temples dedicated to Neptune and Apollo respectively. It possesses two vessels which contain the blood of St. Januarius, Bishop of Benevento, who suffered martyrdom under Diocletian in A.D. 305. Other edifices are the Palazzo Reale (Royal Palace); the palace of Capo di Monte; the old palace, where the courts of justice now hold their sittings; the Palazzo dei Publici Studj, formerly occupied by the university, but now converted into the Museo Nazionale, a museum containing not only a valuable library of 350,000 volumes and many rare manuscripts, but also the older and more recent collections belonging to the Crown, and the Farnese Collection of paintings and sculpture from Rome and Parma; numerous theatres, of which that of San Carlo is one of the largest in existence. Naples has the largest university in Italy. It dates from

1224. The manufactures, which are numerous but individually unimportant, include macaroni, woollens and cottons, silks known as *gros de Naples*, glass, china, musical instruments, flowers and ornaments, perfumery, soap, and chemicals. The exports consist chiefly of bones, cream of tartar, hoops, linseed, hemp, wheat, figs, oil, wine, wool, tallow, rags, and silk, raw, dyed, and manufactured. In the environs are situated the tomb of Virgil, the ancient ruined cities of Herculaneum and Pompeii, the remains of Roman temples, villas, palaces, and tombs, together with the physical phenomena of Vesuvius. Pop. (communal, 1915 estimate), 697,917.

History.—Neapolis ('New City') was founded by a Greek colony from the town of *Cumæ* many centuries before Christ. It took the name of Neapolis to distinguish it from a still older Greek city adjoining called *Parthenŏpē*. It passed to the Romans in 290 B.C. It was taken by Belisarius (A.D. 536), by Totila (542), and by Robert Guiscard (1130), who united the south of Italy and the adjacent Island of Sicily into one political entity, and from that period the history of Naples ceases to be the history of a city, but becomes the history of a kingdom forming part of the Kingdom of the Two Sicilies, Naples being recognized as the metropolis. In the year 1189 the kingdom passed from the Norman to the Swabian race. In 1266 Charles I of Anjou was crowned king of the Two Sicilies, and the kingdom was ruled by this dynasty until 1441, when it came under the dominion of the princes of Aragon. In the early part of the sixteenth century it came into the possession of Spain, and under the rule of the Spanish viceroys broke out the famous insurrection under Masaniello in 1647. It was governed by Austria until 1735, when it was erected into an independent monarchy in favour of Charles of Bourbon. In 1798 the French Republicans entered Naples, which became a republic; but a Loyalist rising led to the return of the king. In 1806 Napoleon succeeded in placing first his brother Joseph, and on Joseph's removal to Spain his brother-in-law Murat, on the throne of Naples. After the fall of Napoleon the Bourbons again ruled in Naples, but in the Revolution that broke out in 1860 under the guidance of Garibaldi, Francis II was deposed, and Naples and Sicily were added to the Kingdom of Italy.—BIBLIOGRAPHY: E. A. Freeman, *History of Sicily from the Earliest Times*; S. R. Forbes, *Rambles in Naples: Archæological and Historical Guide*; A. H. Norway, *Naples, Past and Present*; E. Hutton, *Naples and Southern Italy*.

Naples, Bay of (anciently **Crater Sinus**), on the west coast of Italy, in the Mediterranean, extending for about 20 miles from the Capo di Miseno, its north-west boundary, to the Punta della Campanella, its south-east limit. It is separated from the open sea by the Islands of Procida, Ischia, and Capri.

Napoleon. Napoleon Bonaparte was born at Ajaccio on 15th Aug., 1769, of a family which originally belonged to Tuscany, but which had been settled in Corsica for 250 years. In the summer of his birth France completed her conquest of Corsica, and Bonaparte from the age of nine was educated in France, and entered the French army in 1785. He at first regarded the French Revolution as an opportunity for delivering Corsica from the yoke of France, but was satisfied by its recognition as a department under the constitutional monarchy which was the earliest outcome of the Revolution, and in 1793 the Bonaparte family had to flee from Corsica to Toulon, which in the same year adopted the cause of Louis XVII and received a British fleet. Bonaparte was commander of the artillery of the Republican army at the siege of Toulon, and for his distinguished services in the capture of the town was made a brigadier-general. In 1795 he suppressed a rebellion against the Convention in Paris and was entrusted with the invasion of Italy, which he carried out in 1796–7 under the new government known as the Directory. After a series of brilliant operations he concluded in Oct., 1797, the Treaty of Campo-Formio with Austria, the last (except Great Britain) of the European powers which had opposed the French Republic. Returning to Paris in December, he decided that an invasion of the British Islands was meanwhile beyond the capabilities of the French navy, and organized an expedition to Egypt as a blow to British influence in the East. In July, 1798, he occupied Alexandria, and by the battle of the Pyramids became the master of Egypt, but his designs in the East were rendered impracticable by Nelson's victory in the battle of the Nile (1st Aug.) and by the help given to the Turks by Sir Sidney Smith in the defence of Acre (May, 1799), the capture of which was necessary for Bonaparte's plan of using Syria as a base for an invasion of India or the conquest of Constantinople. He afterwards declared that Smith had come between him and his destiny.

Leaving his army in Egypt, Bonaparte made his way back to France, which was threatened by a second European coalition. He put an end to the Directory and established a new Constitution, by which, as First Consul, he became the ruler of France (Nov., 1799). In the summer of 1800 he defeated the Austrians at Marengo, and, after a second disaster at Hohenlinden in December, Austria was compelled to make the Treaty of Lunéville. Russia had already deserted the second coalition, and peace was made with Great Britain by the Treaty of Amiens (1802).

War was renewed in 1803, and for two years the aim of the First Consul was an invasion of England. It was ultimately rendered impossible by the battle of Trafalgar (Oct., 1805), but before that date he had begun a new Continental war. In 1804 he had become hereditary Emperor of the French, taking the title of Napoleon I, and in 1805 he broke the Treaty of Lunéville by accepting the title of King of Italy. Russia and Austria joined Great Britain in a coalition against him, but he defeated an Austrian and Russian army at Austerlitz (Dec., 1805) and compelled the Austrians to submit. In the following year he destroyed the Prussian army in the battles of Auerstadt and Jena and entered Berlin, and in 1807 he made the Treaty of Tilsit with Russia, and attempted to bring Great Britain to its knees by declaring a blockade and forbidding countries dependent on or allied with France to trade with the British. An occupation of Portugal (which refused to acknowledge this blockade) followed in the same year, and in 1808 he found a pretext for the invasion of Spain, which led to British intervention in the Spanish Peninsula (see *Wellington*). The years 1810–11 witnessed the height of his power. He was supreme in France, and it was impossible to walk from Rome to Hamburg without passing through any country that did not acknowledge French authority. He divorced his first wife (see *Joséphine*), who had borne him no children, and was received into the circles of European royalty by his marriage with Marie Louise, a daughter of the Austrian Emperor (1810).

A quarrel with the Tsar led to an invasion of Russia in 1812, the most notable events of which were the French victory at Borodino and the capture of Moscow, which was burned by the Russians. He had to return among the winter snows, with vast losses to his army, of which less than a tenth survived the campaign, while the conflict in the Spanish Peninsula was constantly draining his resources in men. The Prussians took up arms and were joined by the Austrians, and an army of Russians, Prussians, and Austrians defeated Napoleon at Leipzig (Oct., 1813). In the following winter he declined terms offered by his enemies, but his empire was falling to pieces. In March, 1814, the Allies entered Paris, and in April Napoleon abdicated. He was given the sovereignty of the small island of Elba, whence he escaped in March, 1815, and was received with enthusiasm in France. The Allies prepared to meet him, and he was defeated at Waterloo (18th June), and gave himself up to the captain of H.M.S. *Bellerophon* in July. He was sent as a prisoner to St. Helena, where he died in May, 1821. He employed his time at St. Helena in creating the 'Napoleonic Legend'—a belief that he had been inspired by ideals of liberty, and this belief, aided by Bourbon misgovernment, led to the restoration of his dynasty thirty years after his death. Napoleon was scarcely less great as a legislator than as a soldier; the Code Napoléon is still the basis of French law, and his statesmanship had a profound influence upon Italy and upon portions of Germany. In spite of his consummate intellectual powers, he failed because (in the words of Mr. Herbert Fisher) he "took glory as his end, found it in conquest, and was too often prone to measure it by destruction", and he "remains the great modern example of that reckless and defiant insolence which formed the matter of ancient tragedy and is at war with the harmonies of human life".—BIBLIOGRAPHY: J. Holland Rose, *Life of Napoleon*; J. R. Seeley, *Life of Napoleon*; R. M. Johnston, *The Corsican*; H. A. L. Fisher, *Napoleon* (Home University Library); Lord Rosebery, *Napoleon: the Last Phase*.

Napoleon II, Napoleon François Joseph Charles Bonaparte, only son of the preceding, was born in Paris 1811, died at Schönbrunn 1832. In his cradle he was proclaimed King of Rome. On the first abdication of the emperor he accompanied his mother, Marie Louise of Austria, to Vienna. His title there was Duke of Reichstadt. He never assumed the title of Napoleon II; but on the accession of his cousin Louis Napoleon in 1852, some title being necessary, the late emperor took that of Napoleon III, which, being recognized by the Governments of Europe, implied the recognition of the former title.

Napoleon III, Charles Louis Napoleon Bonaparte, Emperor of the French, was born at Paris 20th April, 1808, died at Chislehurst, England, 9th Jan., 1873. He was the youngest son of Louis Bonaparte, brother of Napoleon I and King of Holland, and of Hortense de Beauharnais. His early life was spent chiefly in Switzerland and Germany. By the death of his cousin the Duke of Reichstadt (Napoleon II) he became the recognized head of the Bonaparte family, and from this time forward his whole life was devoted to the realization of a fixed idea that he was destined to occupy his uncle's imperial throne. In 1836 an attempt was made to secure the garrison of Strasbourg, but the affair turned out a ludicrous failure. The prince was taken prisoner and conveyed to Paris, and the Government of Louis Philippe shipped him off to the United States. The death of his mother brought him back to Europe, and for some years he was resident in England. In 1840 he made a foolish and theatrical descent on Boulogne, was captured, tried, and sentenced to perpetual confinement in the fortress of Ham. After remaining six years in prison he escaped and returned to England. On the outbreak of the Revolution of 1848 he hastened to Paris, and, securing a seat in the National Assembly, he at once commenced his candidature for the presidency. On the day of the election, 10th Dec., it was found that out of 7,500,000 votes Louis Napoleon had obtained 5,434,226; Cavaignac, who followed second, had but 1,448,107. On the 20th the Prince-President, as he was now called, took the oath of allegiance to the Republic. He looked forward to a higher position still, however, and pressed for an increase of the Civil List from 600,000 francs first to 3,000,000, then to 6,000,000, with his term of office extended to ten years, and a residence in the Tuileries. At last, on the evening of the 2nd Dec., 1851, the President declared Paris in a state of siege, a decree was issued dissolving the Assembly, 180 of the members were placed under arrest, and the people who exhibited any disposition to take their part were shot down in the streets by the soldiers. Another decree was published at the same time ordering the re-establishment of universal suffrage, and the election of a President for ten years. When the vote was taken, 7,439,216 suffrages were in favour of his retaining office for ten years, while only 640,737 were against it. As soon as Louis Napoleon found himself firmly seated, he began to prepare for the restoration of the empire. In Jan., 1852, the National Guard was revived, a new Constitution adopted, and new orders of nobility issued; and at last, on the 1st Dec., Louis Napoleon Bonaparte was proclaimed emperor under the title of Napoleon III. On the 29th Jan., 1853, the new sovereign married Eugénie Marie de Montijo, comtesse de Teba; their son, Napoleon-Louis, was born 16th March, 1856. In March, 1854, Napoleon III, in conjunction with England, declared war in the interest of Turkey against Russia. (See *Crimean War*.) In April, 1859, war was declared between Austria and Sardinia, and Napoleon took up arms in favour of his Italian ally, Victor Emanuel. The Allies defeated the Austrians at Montebello, Magenta, Marignano, and Solferino. By the terms of the Peace of Villafranca Austria ceded Lombardy to Italy, and the provinces of Savoy and Nice were given to France in recognition of her powerful assistance (10th March, 1860). In 1860 the emperor sent out an expedition to China to act in concert with the British; and in 1861 France, England, and Spain agreed to dispatch a joint expedition to Mexico, the result of which was the appointment of Maximilian, Archduke of Austria, as Emperor of Mexico. On the conclusion of the Austro-Prussian War of 1866 Napoleon, jealous of the growing power of Prussia, demanded a reconstruction of frontier, which was peremptorily refused. The ill-feeling between the two nations was increased by various causes, and in 1870, on the Spanish crown being offered to Leopold of Hohenzollern, Napoleon demanded that the King of Prussia should compel that prince to refuse it. Notwithstanding the subsequent renunciation of the crown by Leopold, war was declared by France (19th July). (See *Franco-German War*.) On the 28th July Napoleon set out to take the chief command, and on 2nd Sept. the army with which he was present was compelled to surrender at Sedan. One of the immediate consequences of this disaster was a revolution in Paris. The empress and her son secretly quitted the French capital and repaired to England, where they took up their residence at Camden House, Chislehurst. Here they were rejoined by the emperor (who had been kept a prisoner of war for a short time) in March, 1871, and here he remained till his death. His only child, the Prince Imperial, who had joined the British army in South Africa as a volunteer, was killed by the Zulus, 2nd June, 1879.—BIBLIOGRAPHY: Sir W. A. Fraser, *Napoleon III*; A. Forbes, *Life of Napoleon III*; F. A. Simpson, *The Rise of Louis Napoleon*; G. Ollivier, *L'Empire libéral*; J. L. Beaumont-James, *The Story of France.*

Narbonne (Lat. *Narbo Martius*), a city of France, department of Aude, connected with the Mediterranean by canal (5 miles). It has a fine church (S. Just) founded in 1272, and formerly a cathedral. The honey of Narbonne is celebrated. Narbonne was the first colony which the Romans founded beyond the Alps (118 B.C.). It was the capital of Gallia Narbonensis. Pop. (1911), 28,173.

Narcis'sus, according to Greek mythology, the son of the river-god Cephissus. The young Narcissus was of surpassing beauty, but excessively vain and inaccessible to the feeling of love. Echo pined away to a mere voice because her love for him found no return. Nemesis determined to punish him for his coldness of heart, and caused him to drink at a certain fountain, wherein he saw his own image, and was seized with a passion for himself of which he pined away. The gods transformed him into the flower which still bears his name.—Cf. Ovid, *Metamorphoses*, iii, 341–510.

Narcissus, an extensive genus of bulbous plants, mostly natives of Europe, nat. ord. Amaryllidaceæ. The species are numerous, and from their hardiness, delicate shape, gay yellow or white flowers, and smell, have long been favourite objects of cultivation, especially the daffodil (*N. pseudonarcissus*), the jonquil (*N. jonquilla*), polyanthus narcissus (*N. tazetta*), and white narcissus (*N. poeticus*). The daffodil is completely naturalized in many parts of

England, growing in meadows and woods and under hedges.

Narcot′ic, derived from a Greek term signifying numbness or torpor, is the name given to a large class of substances which, in small doses, diminish the sensitivity of the nerves. Most narcotics are stimulating when given in moderate doses; in larger doses they produce sleep; and in poisonous doses they bring on stupor, coma, convulsions, and even death. Opium, hemlock, henbane, belladonna, aconite, camphor, digitalis, tobacco, alcohol, leopard's-bane, and a variety of other substances are narcotics.

Narcotine, an alkaloid contained in opium to the amount of 6 or 8 per cent. It is poisonous in large doses, about 45 grains being sufficient to kill a cat.

Nardoo (*Marsilia macrŏpus*), a clover-like water-fern of Australia, occupying extensive tracts of inundated land. Its dried spore-cases are eaten by the natives.

Nardus, a genus of grasses. *N. stricta*, nard or mat-grass, is abundant on moors in Britain, but has little feeding value.

Nares, Sir George Strong, English Arctic explorer, born 1831, died in 1915. He entered the navy and took part in the Arctic expedition of 1852–4. From 1872 to 1874 he commanded the *Challenger* during her scientific expedition, and in 1875 was first in command of a North Polar expedition. He wrote: *Seamanship*, *Reports on Ocean Soundings*, and *Voyage to the Polar Sea*.

Nariño, a department of Southern Colombia, South America, traversed by the Cordillera Central, and producing gold from (1922) 2452 mines. Sugar, cocoa, potatoes, cereals, and rice are also raised. Pasto is the capital. Area, 9360 sq. miles. Pop. (1918), 340,765.

Narses, the companion-in-arms of Belisarius, and one of the most successful generals of the Emperor Justinian, was an Asiatic slave and eunuch whom the latter had taken into favour and appointed to a command in A.D. 538. Between that period and 552 he put an end to the dominion of the Goths in Italy, and in 553 was himself appointed exarch, and fixed his court at Ravenna. He was deposed under the Emperor Justinus II in 565, and died at Rome in 568.

Narsinghgarh, a native state of the Bhopal Agency, Central India, on the slopes of the Vindhya Mountains. Narsinghgarh, near the Parbati River, is the town. Area, 623 sq. miles.

Narsinghpur, a native state of Bihar and Orissa, India, feudatory to Orissa. The seat of the rajah is at Narsinghpur. Area, 199 sq. miles; pop. of state, 40,000

Narthecium, a small genus of herbs, ord. Liliaceæ. *N. ossifragum*, the bog asphodel, is common on wet moors; it has a creeping stem, a tuft of sword-shaped leaves, and bright-yellow starry flowers with hairy stems.

Narvaez (nár-vä′eth), Ramon Maria, Duke of Valencia, Spanish statesman and general, born 1800, died 1868. In 1844 he formed his first ministry, and received from Queen Isabella the rank of marshal and the title of Duke of Valencia. His Government was overthrown in 1846, but he was soon recalled, and during the remainder of his life was several times entrusted with the formation of a Cabinet.

Narwhal (*Monŏdon monocĕros*), a cetaceous mammal found in the northern seas, averaging from 12 to 20 feet in length. The body colour is whitish or grey spotted with darker patches. There is no dorsal fin. The dentition of the narwhals differs from that of all other members of the dolphin family. In the female both jaws are toothless, but the male narwhal has two incisors in the upper jaw, which are sometimes developed into enormous projecting tusks, though commonly only the one on the left side is so developed, being straight, spiral, tapering to a point, and in length from 6 to 10 feet. It makes excellent ivory. From the frequency with which the narwhal appears as having a single horn it has obtained the name of the *Sea-unicorn*, *Unicorn-fish*, or *Unicorn Whale*. The food of the narwhal appears to consist chiefly of mollusca, and notwithstanding its formidable armature it is said to be inoffensive and peaceable. The Greenlanders obtain oil from its blubber, and manufacture its skin into useful articles.

Narwhal (*Monŏdon monocĕros*)

Naseby, a village in Northamptonshire, England, 12 miles from Northampton. In 1645 Fairfax and Cromwell completely defeated Charles I in the vicinity.

Nash, Richard, known as *Beau Nash*, born at Swansea 1674, died 1761. He was master of the ceremonies at Bath, and for many years was sole arbiter of fashion. He died in comparative indigence.—Cf. Oliver Goldsmith, *Life of Richard Nash*.

Nash, Thomas, English poet, playwright, and pamphleteer, was born in 1567, and died in 1601. He was educated at St. John's College, Cambridge, which he dutifully described as "an university within itself". After graduating B.A. in 1586, he probably visited Italy and Germany.

By 1588 he had settled in London, and adopted the precarious profession of literature. His first work was *The Anatomie of Absurditie* (1589), a kind of comic companion work to Stubbes's *Anatomie of Abuses.* He then became a protagonist in the Martin Marprelate controversy, lashing the Puritans with merciless satire. There is some doubt as to how many of the innumerable anonymous pamphlets were Nash's work, but his *nom de guerre* seems to have been Pasquil, and he almost certainly wrote *Martin's Month's Minde* (1589), *The First Parte of Pasquil's Apologie* (1590), and *An Almond for a Parrat* (1590). On the conclusion of this controversy Nash declared war upon Gabriel Harvey and his brothers, and a series of most amusing pamphlets followed, culminating in *Have with You to Saffron Walden* (1596). Three years later the controversy, which had gone to scandalous lengths, was stopped by the Archbishop of Canterbury. Other interesting works of Nash are: *The Terrors of the Night* (1594); *Christ's Tears over Jerusalem* (written in 1593, during a temporary fit of repentance); and *Lenten Stuffe* (1599), an encomium of Yarmouth and its red herrings. *The Unfortunate Traveller, or the Life of Jack Wilton* (1594), is the earliest English picaresque novel (q.v.). It attempted a new kind of writing which was not again attempted until the time of Defoe. As a prose writer Nash stands very high; in fact his prose is more like that of Shakespeare than is that of any of his contemporaries. He has the same irrepressibility, the same delight in inverted logic, and the same inexhaustible wealth of vocabulary. His two favourite authors and models appear to have been Rabelais and Aretino. As a dramatist Nash does not stand high. His *Isle of Dogs* is lost; but his completion of Marlowe's *Dido, Queen of Carthage* is poor. *Summer's Last Will and Testament*, a satirical masque, is more successful; it contains a charming poem on spring, which is justly given first place in *The Golden Treasury.*—Cf. Sir Walter Raleigh, *The English Novel.*

Nashua, a city of New Hampshire, United States, the county seat of Hillsborough county, on the Nashua River; served by the Boston & Maine Railway. There is a piscicultural station, a trade in agricultural produce, and varied manufactures. Nashua was settled in 1655, incorporated (as Dunstable) in 1673, and became a city in 1853. The name was changed in 1836. Pop. (1920), 28,379.

Nashville, a city of Tennessee, United States, the second city and capital of the state, and the county seat of Davidson county, on the Cumberland River; served by the Louisville & Nashville, and the Nashville, Chattanooga, & St. Louis Railways. It has four universities, the Nashville, Vanderbilt, Fisk (coloured students), and Roger Williams (Baptist). A great commercial centre, Nashville has an extensive transit trade. It was settled in 1780 as Nashborough, and was incorporated (as Nashville) in 1784, being admitted a city in 1806. Pop. (1920), 118,340.

Nasik, a district and town of Bombay province, India. Native cereals are raised in the district. The town is Nasik, on the head-waters of the Godaveri at the foot of the Western Ghâts. It is a place of Hindu pilgrimage, and is on the Bombay-Delhi Railway. Area of district, 5880 sq. miles; pop. 900,000. Pop. of town, about 34,000.

Nasirárbád, or **Maimansingh**, a town of Bengal, India, an important centre of the rice trade; connected by railway with Chittagong and Dacca. Pop. 20,000.

Nasmyth (nā′smith), Alexander, a landscape-painter, born at Edinburgh in 1758, died in 1840. He went early to London, and studied under Allan Ramsay, painter to George III. He afterwards proceeded to Rome, and on his return to Edinburgh he commenced portrait-painting, but soon abandoned it for landscape. His style is remarkable for its simplicity and beauty.

Nasmyth, James, son of the preceding, born in 1808, died in 1890. He was educated at the School of Arts, Edinburgh, and in engineering under Maudslay in London. He removed in 1834 to Manchester, where he became a successful machine constructor and inventor. The steam-hammer, which has rendered possible the immense forgings now employed, was invented by him in 1839. The steam pile-driver and the safety foundry ladle are among his other inventions. He was also a skilled astronomer.

Nassau, a district of Germany. See *Hesse-Nassau.*

Nassau, a seaport-city and capital of New Providence, Bahama Islands (of which it is also the capital). It is defended by forts, and is an export centre for sponges, fruit, salt, and some cotton. There is a wireless station. Nassau was founded by the English in 1629. Pop. 11,000.

Nastur′tium, the genus to which the water-cress belongs. Also a popular name for *Tropæ̆olum majus*, or Indian cress, an American climbing annual with pungent fruits and showy orange flowers; and for *T. minus*, a much smaller species.

Natal′, a province of the Union of South Africa. The coast-line is little broken by inlets, and there is practically only one harbour, which is that of Durban. The surface is finely diversified, rising by successive terraces from the Indian Ocean towards the mountains on the western frontiers, where the chief summits are Champagne Castle, 10,357 feet; and Mont aux Sources, about 11,000 feet. The minerals comprise coal, ironstone, limestone, gold, and marble. Natal is well watered, but none of its rivers, which include the Tugela, Umvoti, and Umgeni, is navigable. The climate is healthy. There are forests in the west and north. Cattle, sheep, and goats are numerous, but rinderpest is prevalent. Maize is by far the chief cereal crop; others are wheat, barley, and oats, but grain and flour are large imports. All kinds of fruits and vegetables are grown. In the warm coast region cotton, tobacco, bananas, pineapples, sugar-cane, tea, and coffee grow well, sugar being an export of some importance, while some tea is also exported. Of wild animals many species are now extinct, and the lion and rhinoceros are found only on rare occasions, although leopards, panthers, and antelopes offer frequent sport. Snakes, several of them venomous, are plentiful.

Natal was discovered on Christmas Day, 1497, by Vasco da Gama, a Portuguese, and named by him ‘ Terra Natalis ’. A small English settlement was formed on Port Natal in 1823. Afterwards discontented Boers from the Cape Colony entered the country, and in 1839 set up a republic at Port Natal. This was deemed incompatible with British interests, and in 1843 Natal, after hostilities with the Boers, was proclaimed British. In 1856 it was separated from Cape Colony and made a separate colony. The invasion of the colony by the Boers in 1899 was followed by the four months' siege of Ladysmith, and its relief by General Buller's forces. In 1906 warlike operations against rebellious Kaffir chiefs were successfully carried out. The capital is Pietermaritzburg or Maritzburg, but Durban is the largest town. Since 31st May, 1910, Natal has been a province in the Union of South Africa. Wool, coal, hides and skins, sugar, and bark are the chief exports, with gold from the interior. Pop. (1911), 1,194,043.

Natato'res, the name, now obsolete, given by Illiger in 1811 to six families of swimming birds. They are characterized by short legs placed behind the centre of gravity, toes webbed or united by a membrane to a greater or less extent, close oily plumage to protect them from low temperature of the water, in which they mostly live and obtain their food. They include the ducks, geese, swans, flamingoes, the penguins, auks, divers, grebes, gulls, pelicans, cormorants, and gannets.

Natchez, a seaport-city of Mississippi, United States, the county seat of Adams county, on the Mississippi; served by the Mississippi Central Railway. It is a great cotton-shipping centre. Settled by the French as a fort, Natchez passed first to Britain (1763) and then to Spain (1779), passing finally to the United States in 1798. It became a city in 1803. Pop. 11,790.

Nation and Nationality. A nation is usually defined as a people inhabiting a certain extent of territory and united by common political institutions, or an aggregate of persons closely associated with each other by common descent and speaking the same or a cognate language. Nationality, on the other hand, is the term designating the *quality* of being a nation, or the condition and status of belonging to one. Frequently, however, the two terms, nation and nationality, are used interchangeably, and hence a certain confusion in the definition of the two concepts. Nationality, however, besides being the quality or characteristic of what is national, may be defined as a population or a group *aspiring* to become a political unity on a common territory; it is thus a nation *in posse*.

A nation is to be distinguished both from a race and from a state, as several nations may be living under the same government. Scotland is a nation, but not a state. Nor is citizenship synonymous with nationality. With regard to the elements which form a nation, they are various, and opinions of historians and sociologists differ as to their importance. History proves that the same group of factors may produce a nation in one case, but will have no effect in another. Anyhow, it would be wrong to imagine that a nation is merely the result of race, language, religion, common territory, or even common political institutions. The formation of a nation differs almost in every case, depending upon each or some of these unifying principles. The principal element instrumental in the formation of a nation is a common past—and a common tradition. Renan rightly defined a nation as a social group whose solidarity has been established by the sentiment of the sacrifices made in the past, and of those it is still ready to make in the future. A nation is thus a social group, usually inhabiting a certain territory, conscious of its collective unity, animated by a sense of its solidarity, united by the bonds of common life and labour, suffering and sacrifice, devotion and danger, and inspired by a ‘ will to live ’ and to co-operate. The collective unity of a nation is, however, the result not so much of common race or language as of a common cultural inheritance, not so much of territory as of tradition. A nation is a psychological phenomenon rather than an ethnical, corresponding to a political fact. It implies a common past, and rests upon the tangible fact of a national home and a close co-operation in the present.

The sense of nationality and the principle of nationalities are modern creations, ‘ the culmination of history ’, as they have been defined. In the ancient world the political unit was the city or the tribe, whilst in mediæval times states were based upon the principles of feudal law. The Roman Empire was a state and not a nation, although the *Pax Romana* was a sentiment almost akin to what we call in modern times national feeling and national pride.

Christianity tended towards the disintegration of nationality, and St. Paul, who appealed to humanity at large, was the greatest opponent of the principle of nationality. In modern times, however, the principle of nationalities has been advocated by politicians and sociologists. It is argued that nations should be homogeneous in race and reconstructed upon ethnological principles. John Stuart Mill had already maintained (*Representative Government*) that nationality and citizenship should be co-extensive, in other words, that the world should consist of national states, and that empires including a variety of races and nations should be broken up. But it was in the nineteenth century that the principle of nationality acquired such a preponderating place in the history of nations, in sociology and in politics, and became one of the ideals for the realization of which the European War was waged. The principle of nationality, officially sanctioned in the war against Austria in 1859, made itself felt all over Europe ever since, in Italy, Greece, Poland, Turkey, and Austria. The exaggerated sense of nationality, of the manifestation of the ego of social or ethnic groups, developed the modern tendency of *nationalism*, which again reached its culmination during the latter half of the nineteenth and the beginning of the twentieth centuries. The object of nationalism is the establishment of autonomy and independence, or even the organization in political states of populations bound together by bonds of nationality. In the majority of cases the feeling of nationalism is fostered and stung into acute self-consciousness by oppression. In modern practical politics nationalism has resulted in the reconstruction of Poland, the creation of Czecho-Slovakia, the independence of Egypt, and in the policy of Zionism.—BIBLIOGRAPHY: A. E. Zimmern, *Nationality and Government*; J. Holland Rose, *Nationality as a Factor in Modern History*; E. Renan, *Qu'est-ce qu'une nation?*; T. Ruyssen, *What is Nationality?*; I. Zangwill, *The Principle of Nationalities*.

National Airs. The adoption by a country of a particular song or hymn as its national anthem is a practice dating from comparatively modern times, and one in which Great Britain took the lead with *God save the King*. The origin of this familiar air was long a question of dispute, and there is even yet some difference of opinion on the subject. Once ascribed to the musician Dr. John Bull (1563–1628), it is now generally regarded as the work of Henry Carey (1692–1743), though there are still some who believe it to be an importation from Germany. First printed (1742) in the *Harmonia Anglicana*, it remained unnoticed until three years later, when the Jacobite rising of the '"45' drew it from obscurity; its rendering at Drury Lane Theatre on Saturday, 28th Sept. in that year was 'encored with repeated huzzas'. It was reprinted in the *Gentleman's Magazine* of the following month, and has remained the British national anthem since that date. The *Auld Lang Syne* of Burns is Scotland's national song; Ireland has *The Wearin' of the Green*, an Irish street ditty of 1798, set to an old English air; and Wales appropriates *God bless the Prince of Wales* and the still more stirring *Men of Harlech*. The American *Yankee Doodle*, of somewhat doubtful origin, is generally recognized as being an English air with words by Dr. Schuckburgh, an American army surgeon; it dates from 1755. This song must to some extent share its claim as national representative with *Hail, Columbia!* and *The Star-spangled Banner*. Colonial national songs include *The Maple Leaf for ever* of Canada, written and composed (1871) by Alexander Muir, and New Zealand's *God girt her about with the Surges*, by Reeves. Chief among European national anthems is the *Marseillaise* of France, written and composed in 1792 by Rouget de Lisle, and named from its having been the popular revolutionary song of the Marseilles volunteers in Paris. More than one national anthem of the Continent was either inspired by, or adapted from, that of Great Britain. *Heil dir im Siegeskranz*, an adaptation of *God save the King*, became the Prussian national hymn in 1793, the English air being used; while Haydn drew from the same source his inspiration to compose (1799) the stately national hymn of Austria, the words finally used, *Gott erhalte Franz den Kaiser*, being written by Baron Zedlitz. A German translation of the British anthem, set to the original music, was sung at a royal celebration in Denmark in 1790, though the Danish national hymn is now *Kong Christian*, with music by Hartmann. Belgium's *La Brabançonne* is, like the *Marseillaise*, a revolutionary song, and dates from 1830, the words being by Jenneval, set to an air by Campenhout. Of the same date is General Lwoff's magnificent Russian anthem, *God the All-terrible*, composed in 1830, and since included in many an English hymnal. In Hungary the honour is shared between the poet Vörösmarty's *Be true to the Land of thy Birth*, Erkel's *Bless our land with gladness*, and the *Rákóczy March* by an unknown composer of the seventeenth century. Norway has also several national hymns, of which it must suffice to mention Björnson's *Yes, we Love this Land*, to music by Nordraak. Sweden has *King Karl, the Young Hero*, by Tegner, while the Dutch anthem is *Oh, ye within whose burning veins*, by Tollens, dating from 1730. In Southern Europe must be mentioned Greece's *Sons of Greece, Arise!* and Portugal's *Hymno constitucional*, composed by Pedro I, Emperor of Brazil. Finally, a national anthem, *May our Lord (Mikado) for ever reign*, is found as far east as Japan.

National Debt. The national debt of a country is the gross capital sum which the Central Government owes to persons from whom it has borrowed money. The development of national debts as we know them dates mainly from the beginning of the nineteenth century, and has taken place almost entirely since the middle of the seventeenth century. There are indeed innumerable earlier examples of borrowing by kings and republics during emergencies, when revenue fell short of requirements. But in the absence of large accumulations of capital and of an organized capital market, opportunities for borrowing were limited, while the honesty and credit of borrowers were frequently not such as to tempt lenders. It was therefore common in the Middle Ages for kings to accumulate treasures which could be used in case of need. The decay of this system is connected with the growth of modern capitalism, which increased opportunities for borrowing, as well as the amounts required (e.g. to equip and maintain armies in the field). It is not without significance that mediæval Venice and Genoa, where banking systems had grown up, are amongst the earliest instances of states with a regular national debt.

The origin of the British national debt was also bound up with the foundation in 1694 of the Bank of England, which was established largely for the purpose of lending money to the Government of William III, whose finances were in a chaotic condition. The debt grew rapidly during the wars of the eighteenth and early nineteenth century, increasing from £21½ million in 1697 to £53½ million in 1714, £78 million in 1748, £139½ million in 1764, £268 million in 1783, and £885 million in 1816 at the end of the Napoleonic wars. This was the highest point reached until the recent European War, on the eve of which the debt stood at £707 million. During the war it rose rapidly to no less than £8079 million in Dec., 1919, which was about the maximum reached.

Before the European War the bulk of the debt (£586 million in 1914) was funded debt. This term originally signified debt the interest of which was charged upon definite taxes, revenues, or funds; but with the improvement of British credit it became customary to charge interest upon the general revenue of the country, and funded debt came to mean the permanent debt in respect of which the State had undertaken to pay interest, but not to repay the capital at any definite date. Since the European War the expression is sometimes used more loosely to include debt which is not permanent, but is not redeemable for a period of years. The counterpart of funded debt is unfunded or floating debt, which strictly means redeemable debt, but is now sometimes loosely used to designate short maturities—particularly Treasury Bills and Advances on Ways and Means Certificates. There is also a small class of debt intermediate between funded and unfunded debt, consisting of terminable annuities—a favourite form of borrowing in times gone by. During the European War British Government borrowing was represented entirely by redeemable debt (unfunded debt in the strict sense). The conditions attached to the loans were most diverse, with a view to attracting as much capital as possible, and the periods of maturity ranged from a considerable number of years in the case of the big war loans to a few months in the case of Treasury Bills; while War Savings Certificates were repayable virtually on demand. An important reason for borrowing on a temporary basis, rather than funding, was that lenders had come in the years before the European War to prefer securities redeemable at a fairly near date, owing to the depreciation which was occurring in the capital value of long-dated and irredeemable securities. No great difficulty need be anticipated in renewing loans as they fall due, and it is now largely a matter of convenience whether the State borrows in perpetuity or for a period of years. It is, however, undesirable that a large amount should be outstanding at short maturities, as this leads to continual uncertainty in the money market and to credit disturbances. The British Government has therefore made efforts to replace Treasury Bills and Ways and Means Advances by loans with longer maturity.

In peace-time the British Government normally aims at reducing the burden of the debt by redemption out of surplus revenue. For some years before the war two Sinking Funds existed for the purpose. The Old Sinking Fund consisted of the sum by which Exchequer receipts in any year happened to exceed Exchequer issues in respect of expenditure chargeable against income; and the New Sinking Fund consisted of the balance of a permanent annual charge for the service of the debt after defraying the actual expenditure for such service. During the war the Sinking Funds were of course suspended, and the permanent post-war policy in regard to reduction of debt has not yet been settled.

A few words must be said about the national debts of other countries. During the nineteenth century periods of war were responsible for a rapid growth of debt, which was seldom much diminished by subsequent redemption, the United States, whose Revolutionary and Civil War debts were largely repaid, being an exception. The growth of debt among countries engaged in the European War eclipses all previous records, and leaves the countries concerned staggering under a burden which some cannot bear.

Apart from war debts, an increasing amount has been borrowed by an ever-growing number of countries for purposes of economic development. This applies to European Governments which have borrowed for railway construction and nationalization, for telegraphs and telephones, &c.; but more particularly to the Governments of new and undeveloped countries, including the British Dominions, and to India. Many of these countries have borrowed largely in England, where capital is relatively plentiful, and their debt contracted here is usually expressed in sterling. National debt contracted abroad and expressed in foreign currencies is known as external debt, while debt contracted in national currency within the country is known as internal debt. Internal debt, however, may be purchased by foreigners, and external debt may be purchased by nationals; and to the extent to which this is done the importance of the distinction is lessened. During the war Great Britain contracted a large external debt, mainly to the United States Government, and the European Allies contracted external debts to the British Government and to the United States Government. When an external debt is contracted for purposes of development, the service of the debt is rendered easy, because the revenue of the borrowing country is directly increased by the investment of capital; but when the debt is contracted for purposes of war, the revenue of the borrowing country is not increased by the loan, and the service of the debt is consequently more difficult. The impoverishment of the European Allies by the war renders the problem of making payments in respect of Inter-Allied war debts peculiarly difficult.—BIBLIOGRAPHY: Adam Smith, *Wealth of Nations*; Adam, *Public Debts*; Andreades, *History of the Bank of England*; C. F. Bastable, *Public Finance: Statistical Abstract of the United Kingdom.*

National Gallery, The, the British national picture-gallery. This collection of paintings, situated in Trafalgar Square, London, originated in a collection formed by Angerstein, consisting of 38 pictures, 29 by old masters and 9 by British painters, and purchased with public funds in 1824 for £57,000 as the nucleus of a national gallery. Since that time the collection has been greatly enlarged by purchases out of moneys provided by Parliament, as well as by bequests and gifts. Of the latter the most munificent has been that of Vernon in 1847, a collection of 157 works of English painters. Another highly valuable section is that of the pictures and drawings by Turner bequeathed to the nation at his death in 1851. In 1871 a valuable prize was secured by the purchase for £75,000 of Sir R. Peel's collection, consisting of 77 paintings and 18 drawings. In 1885 Parliament voted £70,000 for the purchase of a single picture, the *Ansidei Raffaelle*, together with £17,500 for another, Vandyck's *Charles I on Horseback*. The National Gallery now comprises fully 1200 pictures, and though specially strong in examples of the British school of painting, foreign masters are fully represented. In 1887, by the completion of the new rooms, which had been in progress since 1885, sufficient space was obtained to permit of an orderly arrangement of the pictures. This gallery, while not the largest, is one of the finest in all Europe.—A *National Gallery of British Art* was presented to the nation by Sir Henry Tate, and opened in 1897.—*The National Portrait Gallery* is distinct from the National Gallery, though adjoining it. Founded in 1856, it now contains about 2000 portraits and busts. The Scottish National Gallery and National Portrait Gallery are accommodated in Edinburgh.

National Guards, in France, an armed organization of the inhabitants of towns or districts for local defence, differing mainly from the militia and volunteers of Britain in that it was at the disposal of the respective municipalities rather than of the Crown. After the suppression of the communal revolt in Paris (1871) the National Assembly decreed the dissolution of the National Guard.

National Health and Unemployment Insurance.—The idea of State responsibility for the distress arising to the individual out of illness (and consequent inability to work), and out of unemployment, grew very gradually in the British public mind. Its beginnings were visible in the Poor Law legislation of the early nineteenth century, but not till after nearly a hundred years was there anything like a general acceptance of this common responsibility and a sense of remedial obligation on the part of the State. The individual's duty to the State had been better inculcated upon the community than the State's duty to the individual.

In 1911, however, was passed an Act of Parliament which imposed the necessity of accepting the principle of State responsibility for meeting the individual hardship accruing from sickness and unemployment by a State system of insurance against these evils. This Act was described (in its preamble) as " an Act to provide for insurance against loss of health and for the prevention and cure of sickness, and for insurance against unemployment and for purposes incidental thereto". It became law in Dec., 1911, and was put into force as from 15th July, 1912.

This Act of 1911, though in itself only a beginning, now forms the basis of a much more imposing superstructure of insurance than was then contemplated, and is worthy of some detailed consideration. It was in three parts. Part I dealt with National Health Insurance, Part II with Unemployment Insurance, and Part III with miscellaneous provisions relating to Parts I and II. Seeing that Health Insurance and Unemployment Insurance, both under this 1911 Act and at the present day (1922), are administered by separate departments of Government, it will be more convenient for the purposes of this article to deal with each subject separately.

Health Insurance.—Speaking broadly, every working person receiving wages or salary at a rate amounting to less than £160 a year was insurable under this 1911 Act, and in the case of manual workers insurance was compulsory. There were *exceptions*, such as employees of public authorities and institutions, whose work was of a permanent nature, and also certain *exemptions*, notably persons able to prove that they had private means amounting to not less than £26 a year. The rates of contribution payable in respect of each insured person were: for a man, 7*d.* a week, for a woman, 6*d.* a week; but of this sum the employer paid 3*d.* a week, whether for a man or a woman. In the case of employees over twenty-one years of age whose remuneration did not exceed 2*s.* 6*d.* a working day and did not include the provision of board and lodging by the employer, varying rates of contribution were paid. Persons exempt from insurance paid no contributions, but the employer nevertheless paid his 3*d.* per week in respect of each one. To the contribution paid for each fully-insured person the State contributed in effect 2*d.*, so that the total sum available for the provision of benefits was 8*d.* in the case of a woman, and 9*d.* in the case of a man, the employer's contribution representing three-ninths of this latter sum, the State's two-ninths, and the worker's four-ninths. The phrase "Ninepence for fourpence" was widely current at the time as representing the workers' insurance 'bargain'.

To obtain the fullest benefits of Health Insurance it was necessary under this 1911 Act (and still is) for the insured person to become a member of what was known as an 'approved society'. Friendly societies of various types had for many years been giving 'sickness benefits' to their members, and it was considered desirable to make use (after establishing suitable safeguards) of the best parts and features of this ready-made machinery for administering benefits under a State scheme of Health Insurance. Many leading friendly societies of the country qualified as approved societies. In addition some of the large industrial insurance companies established separate sections for administering benefits under the Act, and these sections were recognized as approved societies. Any insurable person who was not a member of an approved society might participate in the State insurance scheme as a 'deposit contributor', but with certain limitations as to privileges as compared with a member of an approved society. There were also certain facilities for 'voluntary contributors'.

The benefits to the insured person under the 1911 Act were as follows:

1. Medical Benefit. Medical attendance during illness, including the provision of medicine.[1]
2. Sanatorium Benefit. Treatment in sanatoria or similar institutions for sufferers from tuberculosis.
3. Sickness Benefit. Payment, for a period not exceeding twenty-six weeks during incapacitation from work by disease or disablement, of 10*s.* a week in the case of men, and 7*s.* 6*d.* a week in the case of women.
4. Disablement Benefit. Payment of 5*s.* a week for either men or women so long as incapacity for work continued after the twenty-six weeks of 'sickness benefit' had terminated.[2]
5. Maternity Benefit. Payment in the case of the confinement of the wife of an insured person or of any other insured woman of a sum of 30*s.*

Acts amending the 1911 Act were passed in each year of the succeeding decade with considerable effect on its benefits, scope, and mode of administration, but without any great alteration of underlying principle. Under the 1911 Act Health Insurance was administered by four separate national Commissions, one each for the four kingdoms, and one joint Committee of these four Commissions. Local Insurance Committees in each county and county borough administered 'medical benefit', all other benefits, except those of deposit contributors, being administered through the approved societies. But since 1919 England and Wales have come under the Ministry of Health, and Scotland under the Scottish Board of Health. In 1922 the Irish Insurance Commission's work passed to the Government of Southern Ireland, except for health services in respect of insured persons resident in Northern

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[1] In Ireland medical benefit was not provided, and the rates of contribution payable in respect of insured persons were correspondingly smaller.

[2] Sickness and disablement benefits ceased when the insured person reached the age of seventy years.

Ireland, which were transferred to the Government of Northern Ireland, and placed by them under the Ministry of Labour for Northern Ireland.

The various amending Acts, 1913–21, also altered very considerably the rates of contribution and of benefit. Following the lessening of money values and the rise in wages during the European War, an Act was passed in 1919 to bring within the scope of the State Health Insurance scheme workers in receipt of wages and salaries not exceeding £250 a year. From 5th July, 1920, the contribution payable in respect of insured persons was increased to

10*d.* a week in the case of males;
9*d.* a week in the case of females;
5*d.* a week (for the employer) in the case of exempt workers.

Of these amounts the employee paid (by deductions from wages)

5*d.* a week in the case of a man;
4*d.* a week in the case of a woman.

Workers over eighteen years of age not in receipt of more than 4*s.* a day, and not provided by their employer with board and lodging, paid less.

Under this extended scheme the State's contribution to the total sum available for the provision of benefits in respect of each insured person was changed to two-ninths all round, instead of two-ninths in the case of men, and two-eighths in the case of women, as it had been under the 1911 Act.

Benefits were increased to the following amounts, at which they still (1922) remain:

	Men.	*Women.*
Sickness benefit ..	15*s.* a week.	12*s.* a week.

Until after 104 weeks from entry into insurance and the payment of 104 weekly contributions the rates of benefit were:

	Men.	*Women.*
Sickness benefit ..	9*s.* a week.	7*s.* 6*d.* a week.
Disablement benefit ..	7*s.* 6*d.* a week.	7*s.* 6*d.* a week.
Maternity benefit ..	40*s.*	

Other amendments of note to the 1911 Act concerned insured women who married; soldiers, sailors, and airmen who were allowed to continue their insurance membership during service, the contributions payable in respect of them being met by the Admiralty, the Army Council, and the Air Council; and mercantile mariners (masters, seamen, or apprentices), who are subject to special provisions as to Health Insurance.

The accompanying table of expenditure of approved societies (England and Wales) on sickness and disablement benefits in the years 1913–20 allows of some generalizations as to the incidence of sickness and disablement among the working-classes—the classes to whom the Health Insurance Act applies virtually exclusively.

	Sickness Benefit.		Disablement Benefit.	
	Men.	Women.	Men.	Women.
1913	£3,623,220	£1,770,371	—	—
1914	4,014,187	1,732,327	£124,212	£36,781
1915	3,141,548	1,393,402	514,681	210,573
1916	2,683,782	1,176,181	655,241	308,688
1917	2,495,637	1,163,941	706,050	355,994
1918	2,877,861	1,445,812	729,780	393,891
1919	3,098,263	1,326,998	772,232	430,282
1920	3,667,081	1,678,092	1,104,621	629,890
Total	25,601,579	11,687,124	4,606,817	2,366,099
Average per Annum	3,200,200	1,460,891	658,117	338,014

Allowing for the respective maximum rates of sickness and disablement benefit current during these periods, this expenditure for the eight years represents a yearly average of one week's

Sickness.		*Disablement.*
6,217,048 men	....	2,699,011 men
3,771,405 women	....	1,378,536 women
9,988,453		4,077,547

a total of 14,066,000 weeks' work lost on an average every year, or a period of 270,000 years. In other words, England and Wales on this average lose every year through sickness the equivalent of the work of 270,000 persons, in the insured or working-classes alone.

The number of insured persons entitled to medical benefit in 1920 in England and Wales was 13,873,000. The number actually on doctors' lists was 11,968,000. The number of doctors taking part in the Insurance Medical Service was approximately 12,000. About 34 per cent of these had not more than 600 persons each on their lists, 30 per cent had between 600 and 1200, 22 per cent had between 1200 and 2000, and 14 per cent had more than 2000. About 10,300 chemists, some of them with more than one shop, supplied medicines and drugs under the scheme.

Unemployment Insurance.—The Unemployment Insurance Section of the 1911 Act came into force on the same date as the Health Insurance Section, viz. 15th July, 1912, and was administered for some years by the Board of Trade.

It applied only to certain trades: (1) building, (2) construction of works, (3) shipbuilding, (4) mechanical engineering, (5) iron-founding, (6) construction of vehicles, (7) sawmilling. The rates of contribution were as follows:

	Per week.
For every workman employed in an insured trade	2½*d.*
For every employer in respect of each workman so insured	2½*d.*

Certain reduced rates applied in the case of workmen below the age of eighteen

To the money thus raised from employers and employed the Government added an amount equal to one-third.

The rate of unemployment benefit in respect of each week following the first week of unemployment was 7*s.*, but no benefit was paid to a worker under seventeen years of age, and to a worker between the age of seventeen and eighteen benefit was paid at one-half the ordinary rate. Benefit was not paid for more than fifteen weeks in any period of twelve months.

Various amending Acts were passed in the years 1914, 1915, 1916, 1918, 1919, 1920, and 1921, with considerable changes in the scheme's scope and administration.

An Act of 1920, which came into operation on 8th Nov. of that year, extended the principle of compulsory unemployment insurance to all manual workers and to virtually all workers in receipt of less than £250 per annum. The main exceptions were private domestic servants, agricultural workers, established (i.e. permanent) civil servants, teachers, and (subject to a certificate from the Minister of Labour that the employed person was not liable to dismissal except for misconduct, neglect, or unfitness, and that the terms of his employment made unemployment insurance unnecessary) the servants of public authorities and companies. The number of persons brought into unemployment insurance by this extension, which is still in force, was approximately 9,000,000.

An Act of 1921 established the following rates of contributions and benefit, which are still in force.

On and after 4th July, 1921, the weekly rates of contribution became:

	Employer.	*Employed.*	*State.*	*Total.*
Men ..	8*d.*	7*d.*	3¾*d.*	1*s.* 6¾*d.*
Women..	7*d.*	6*d.*	3¼*d.*	1*s.* 4¼*d.*
Boys ..	4*d.*	3½*d.*	1¾*d.*	9¼*d.*
Girls ..	3½*d.*	3*d.*	1¾*d.*	8¼*d.*

On 30th June, 1921, the weekly rate of unemployment benefit became:

Men	15*s.* 0*d.*
Women	12*s.* 0*d.*
Boys (between the ages of 16 and 18)	7*s.* 6*d.*
Girls	6*s.* 0*d.*

Under this Act certain extensions were granted as to the number of weeks' unemployment benefit that might be drawn by any insured person for the period from 3rd March, 1921, to 2nd July, 1922, but after that date the period of benefit was limited to twenty-six weeks for any insured person in any one insurance year.

A 'waiting period' of one week's (six working days) unemployment became necessary before an insured person could draw unemployment benefit. Section 44 of the 1920 Act, under which eight weeks' benefit might be drawn if four or more weekly contributions had been paid, was repealed as from 30th June, 1921, and a qualifying period of twenty weeks in insurable employment was established. Naturally, also, certain conditions as to receipt of benefit were established to safeguard against imposture or abuse.

According to Ministry of Labour returns, the registers of the employment exchanges in the United Kingdom on 27th March, 1922, contained the names of 1,739,764 persons registered as wholly unemployed, exclusive of short-time workers and of persons unemployed owing to a strike or lock-out. The details of unemployment (which reached its highest point on 24th June, 1921) were as follows:

	24th June, 1921.		*27th March, 1922.*
Men ..	1,549,307	....	1,358,800
Boys ..	84,031	....	55,492
Women ..	477,627	....	285,076
Girls ..	66,934	....	40,396
	2,177,899		1,739,764

The number of persons on short time and claiming insurance benefit had varied as follows:

1st July, 1921.		*31st Jan., 1922.*		*27th March, 1922.*
988,394	....	287,493	....	233,000

The cost to the State of unemployment insurance in the United Kingdom was estimated in the spring of 1922 as being £14,700,000 for the fifteen months beginning April, 1922, or roughly £1,000,000 a month.

Nationalists, a term applied to a political party in a country, forming part of another country, which demands autonomy or complete independence. The term was generally applied to the Irish political party whose programme included the more or less complete separation of Ireland from Great Britain. The Irish Nationalist party almost disappeared in 1918, when the Sinn Fein party took its place.

Natrolite, a zeolite of the Mesotype group, so called on account of the great quantity of soda it contains. It occurs in the cavities of volcanic lavas, or as a direct decomposition-product within soda-lime felspars, and consists of 48 per cent silica, 26 alumina, 16 soda, and 10 water.

Natron ($Na_2CO_3 10H_2O$), native sodium carbonate or mineral alkali, found in the ashes of several marine plants, and abundantly in lakes in Egypt, and in some mineral springs.

Natron Lake, a lake of Africa, near Lake Magadi. Both contain enormous deposits of soda.

Natterjack, or **Natterjack Toad**, the *Bufo calamita*, a species of toad found in various parts of Western Europe, in certain parts of Asia (including Tibet), and not uncommon in England. The general colour is lightish-brown, spotted with patches of a darker hue. A line or streak of yellowish tint passes down the middle line of the back. It does not leap or crawl like the common toad, but rather runs, whence it has the name of walking or running toad. It has a deep and hollow voice, audible at a great distance. It is often found in dry situations.

Natural Gas. See *Petroleum.*

Natural History, in its widest sense, that department of knowledge which comprehends the sciences of zoology and botany, chemistry, natural philosophy or physics, geology, palæontology, and mineralogy. It is now, however, commonly used to denote collectively the sciences of botany and zoology, and it is sometimes restricted to denote the science of zoology alone.—Bibliography: Kerner, *The Natural History of Plants*; Ainsworth Davis, *The Natural History of Animals.*

Naturalism, in philosophy, is the theory which maintains that the cause of events in the universe can be explained by imminent natural principles, and denies the existence of any transcending power. It is a tendency to look upon nature as the fundamental cause of everything that exists and to explain everything in terms of nature. It denies the dualism of matter and mind, mental phenomena being only manifestations of matter. Reducing as it does the principles governing the universe to mechanical laws, naturalism is synonymous with materialism, but it differs from it in so far as it is not concerned with the problem of the essence of matter. Sometimes naturalism admits the existence of a dual principle, matter and mind, but denies the transcendence of the first cause, or God, which is both *natura naturans*, and *natura naturata*. It is thus synonymous with *Pantheism* (q.v.). Naturalism is not, strictly speaking, a philosophical system, as it pervades various philosophical doctrines. The result of, and stimulated by, a scientific awakening, naturalism is a revolt against the supernatural—and an attempt to explain phenomena in scientific terms, reducing everything to the laws of matter, motion, and evolution. Democritus, Epicurus, and Lucretius were naturalists. The philosophies and doctrines of Aristotle, Spinoza, and Hobbes may be called naturalistic in their tendencies, and modern philosophy, endeavouring as it does to explain experience in terms of natural science, is generally naturalistic. Whilst the older naturalism, however, was frankly atheistic, modern naturalism is agnostic in its tendencies.

In literature, naturalism is the extreme of realism, and even something more than realism. The realist closely imitates nature, whilst the naturalist not only describes the realities of life, but revels in the description of its more repellent aspects. Naturalism is the keynote of the works of many modern French authors, particularly of those of Zola, and of the modern German drama. In English literature we have many realists, but their realism has never been so extreme as to deteriorate into naturalism.—Bibliography: R. Otto, *Naturalism and Religion*; J. Ward, *Naturalism and Agnosticism*; J. S. Haldane, *Mechanism, Life, and Personality.*

Naturalization is the process by which an alien adopts the status of a subject. In the United Kingdom the conditions of naturalization are governed by the British Nationality and Status of Aliens Acts, 1914 and 1918. The Home Secretary may grant a certificate of naturalization to any alien who satisfies him (1) that he has resided in His Majesty's dominions or been in the service of the Crown for at least five years out of the preceding eight, at least the last year of residence having been in the United Kingdom; (2) that he is of good character and has an adequate knowledge of the English language; and (3) that he intends to reside in His Majesty's dominions or continue in the service of the Crown. The certificate is not effective until the oath of allegiance has been taken. The power of the Home Secretary to refuse a certificate is absolute. A naturalized alien has all the rights and obligations of a natural-born subject.

Natural Philosophy. See *Physics.*

Natural Selection is the fundamental idea implied in Charles Darwin's teaching. On 1st July, 1858, the two essays written independently by Darwin and Alfred Wallace were submitted to the Linnæan Society of London as a joint paper "On the Tendency of Species to form Varieties; and on the Perpetuation of Varieties and Species by Natural Means of Selection". In this communication Darwin first made public the phrase 'natural selection', and Wallace 'the struggle for existence', although the former had given expression to both ideas in his notebooks twenty years before this public announcement. On

24th Nov., 1859, Darwin's *magnum opus* was published "On the Origin of Species by Means of Natural Selection, or the Preservation of Favoured Races in the Struggle for Life"—a title which clearly defines what is implied in Darwinism. Some years afterwards he wrote "I have spoken of selection as the paramount power, whether applied by man to the formation of domestic breeds, or by nature to the production of species". In other words, Darwin claimed that, just as men by careful selection of animals or plants showing certain qualities can breed a great variety of horses, dogs, pigeons, or in fact almost any animal or plant, so the varied natural circumstances may prove unfavourable to the living organisms presenting some traits and favourable to these presenting others, and bring about by natural means a selective process in some respects analogous to what the breeder effects by the deliberate choice of animals and plants for mating. For more than half a century this claim has been assailed by every kind of misrepresentation as well as by serious and honest argument; and at the present time it has become a fashionable pose among certain biologists to scoff at natural selection and erroneously to pretend it was put forward to explain the variability of organisms. But Darwin himself refuted such criticisms in advance when he wrote (*Origin of Species*): "Some have even imagined that natural selection induces variability, whereas it implies the preservation of such variations as arise . . .; unless such occur natural selection can do nothing". This is a clear and explicit statement of unassailable fact, which is not weakened, but immensely strengthened, by the modern developments in the study of heredity and variation (see *Evolution*). A vast literature has grown up as the result of the discussion of the leading principle of Darwin's illuminating generalization. A useful and concise guide to this controversial writing is Professor E. B. Poulton's *Charles Darwin and the Theory of Natural Selection* (1901), and the more recent criticisms are dealt with in Professor Edwin S. Goodrich's excellent little book, *The Evolution of Living Organisms*.

Natural Theology, a branch of theology dealing with the knowledge of God's existence as derived from the observation of nature and through the light of reason, independent of revelation. It is religion derived from nature and reason, by the aid of which, without that of supernatural revelation, it endeavours to prove the existence of God. It treats of the nature, character, and attributes of God; the relation of God to the world and to man, and of man and the world to God. One of the principal arguments of natural theology is what may be called the *cosmological argument*. Every effect must have a cause, and the laws of natural selection or survival of the fittest must have had a lawgiver. The prevalence of order in nature tends to prove that the universe is an event or a generated existence, the work of intelligence. Both organic and inorganic nature alike show clear proofs of harmony and order, presupposing an intelligent cause.

Another argument is based upon design, and is called the *teleological* argument. We notice how nature is constantly acting with a deliberate design, or purpose, how the whole universe is adapted to its environment, and how the different parts of the organism are adjusted in the interests of the whole. It cannot be the result of random disorder, 'purposeless change superinduced upon meaningless uniformity', but the work of a transcendental and powerful Being who originated all things with a purpose. Even the laws of evolution and of natural selection cannot, according to natural theology, exclude the argument from design. "Selection", wrote A. J. Balfour, "may enable organic species to adapt their powers to their environment, and their environment to their powers, but it cannot produce either the original environment, or the original living matter."

It is further claimed by natural theology that the idea of the existence of a Supernatural, Superior Power is innate in the human mind, and as the human mind is capable of conceiving such a Supernatural Being, it is evidence of the reality of existence of such a Power. Questions of natural theology were discussed by various ancient philosophers, as Socrates, Plato, Aristotle, and Cicero; but the first regular treatise on the subject was the *Theologia Naturalis* of Raymond de Sabunde, who died in 1432. Among modern works on the subject are: Paley's *Natural Theology*, Chalmers's *Natural Theology*, and *The Bridgewater Treatises*. See *Theism*.—BIBLIOGRAPHY: A. J. Balfour, *Theism and Humanism*; R. Flint, *Theism*; F. Max Müller, *Natural Religion*.

Nature Printing, a method which has occasionally been used for producing pictures of such objects as ferns and sea-weeds. The essential feature of the method is that no drawing is needed, the electro used by the printer being derived from an impression made on a metal plate by the object itself.

Nature Worship, or **Naturism**, the worship of nature as a whole, i.e. of all things in nature, including not only the elements and celestial bodies, but also plants, animals, and man. Nature worship is to be distinguished both from naturalism, which is a system of philosophy, and from natural religion, which endeavours to prove the existence of God without the aid of Revelation. According to some thinkers, nature worship is the most ancient form of religion. Primitive man, destitute of religion, ignorant but emotional, seized with wonder at the aspect of the world and its constant changes, attributed to the phenomena surrounding him a life and an activity similar to his own. Constantly in touch with nature, dependent upon it for his daily existence, benefiting by its bounties, threatened by its dangers, to him nature was at once awe-inspiring and worshipful, in turn hostile and friendly, and his thoughts became concentrated upon it and upon its striking phenomena. Conceiving nature as animated throughout, attributing to the external objects which surrounded him a motion and life similar to his own, he evolved the idea of supernatural beings dominating the most striking phenomena. "In his anxiety", writes Professor Menzies (*History of Religion*), "for food and warmth, man could not fail to think of the beings who, he had observed, had power to supply him with these comforts." Struck by the activity of the objects of nature, their movements, motions, and powers, he compared them to his own personality, concluded that they were alive, and worshipped them. It is generally admitted that nature worship is of very ancient date, and that since his earliest existence man always showed a tendency to experience vague religious emotions when coming into contact with nature. But the theory of Max Müller, who maintained that nature worship was the most primitive form of religion, and also the theories of Tylor and Spencer, who endeavoured to prove that ancestor worship was the earliest form of religion, have been discarded by ethnologists. It has been proved that man worshipped other gods even before he turned to nature as a subject of adoration.—BIBLIOGRAPHY: D. G. Brinton, *The Religions of Primitive Peoples*; Sir J. G. Frazer, *The Golden Bough*.

Nau′kratis, an ancient Greek city in Egypt, which stood on a navigable canal in the western part of the Delta near the Canopic branch of the Nile. It existed as early as the beginning of the seventh century B.C., and had been a place of great splendour. Excavations on the site of the city by Flinders Petrie have been productive of highly valuable results.—Cf. W. M. Flinders Petrie, *Naukratis*.

Naumburg (noum′bųr*h*), a town of Prussian Saxony, in the valley of the Saale. One of the principal buildings is the cathedral, partly Gothic and partly Romanesque, completed in 1249. The manufactures consist of combs, playing-cards, leather, and hosiery. Pop. 26,960.

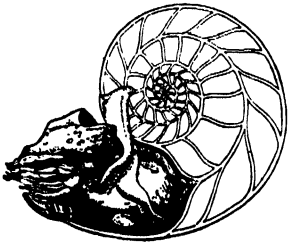
Nau′plius, a term applied to the earliest stage in the development of the lower Crustacea. The naupliiform larva has an ovate unsegmented body, a median eye, and three pairs of limbs. This form is regarded as the primitive form of all crustaceans.

Nauru, or **Pleasant Island**, an island of the Southern Pacific, in 166° E. long., 26 miles S. of the equator. The climate is healthy, and malaria is unknown. Six-sevenths of the total area of 12 sq. miles is phosphate-bearing. Until 1914 Nauru formed a part of German New Guinea, and was occupied (Nov., 1914) by a detachment from the Australian expedition at Rabaul. By the Peace Treaty (1919) the British Empire became mandatory by League of Nations' mandate dated 17th Dec., 1920, and authority, administrative, legislative, and judicial, is vested in an Administrator, whose expenses are met from local revenue and from the proceeds of the sale of phosphates. The quality of these phosphates is very high, and the total deposits are estimated at 100,000,000 tons, of which 3,750,000 tons have already been removed. Employees of the Commission at Nauru comprise 60 Europeans, 554 Chinese, 200 Caroline Islanders, and 40 natives from the territory of New Guinea.

Nau′sea is the sensation of sickness with an inclination to vomit. It occurs in many functional disorders, as well as in organic disease, of the stomach. It also arises reflexly, as in seasickness, as the result of emotions, disgust, and fear, or following irritation and disturbance of almost any part of the abdominal tract.

Nautiloidea, a great group of shell-bearing cephalopods, now represented only by the genus Nautilus, but including genera of various forms throughout Palæozoic times. The shell is chambered, and the partitions are simply curved. The tube running through them is practically central, and the calcareous neck supporting it at each partition is directed backwards. The straight form Orthoceras (q.v.) is an important genus. The genus Nautilus appears in Triassic times.

Nau′tilus, a genus of cephalopods with many-chambered shells, the only surviving genus of the sub-class Tetrabranchiata. The shell of the pearly nautilus (*N. pompilius*) is a spiral with smooth sides. The turns or whorls are contiguous, the outer whorl covering the inner.



Pearly Nautilus (*Nautilus pompilius*) in section

The chambers of the shell are separated by transverse septa, and one after the other have been the residence of the animal, being successively abandoned as it has grown. The animal thus always resides in the cavity of its outermost or external chamber. A siphuncle connects the body with the air-chambers, passing through each transverse septum till it terminates in the smallest chamber at the inner extremity of the shell. These internal chambers contain only air. By means of the siphuncle the animal is enabled to sink itself or to swim. The nautilus is an inhabitant of the tropical seas. Only three or four existing species are known, though the fossil species exceed a hundred. The name is often loosely applied to the shells of different genera of mollusca. The animal which has been said to sail in its shell upon the surface of the water is the paper-nautilus or argonaut. See *Argonaut.*

Nauvoo, a city of Illinois, United States, in Hancock county, on the Mississippi. It was founded in 1840 by the Mormons, and afterwards occupied between 1850 and 1858 by a company of French Socialists. Pop. 1020.

Navajo (or Navaho) Indians (nȧ-vä′hō), a tribe of American Indians numbering about 12,000. They occupy a reservation in the north-west of New Mexico and the north-east of Arizona.

Naval Cadets. See *Navy.*

Naval Division, Royal. In modern times naval forces have successfully been employed as land forces. The British Naval Brigade, under Sir Percy Scott, took a prominent part at Ladysmith and Colenso (South African War), and both the French and Germans have used naval forces in previous campaigns, as well as in the European War. The formation of the Royal Naval Division (subsequently known as the 63rd (R.N.) Division or R.N.D.) at the end of Aug., 1914, and the use on land of men trained for sea-service was therefore no new departure. The three brigades were fully constituted by 24th Aug., 1914, and comprised the 1st Brigade (Benbow, Drake, Hawke, and Collingwood Battalions), 2nd Brigade (Nelson, Howe, Hood, and Anson Battalions), and the Marine Brigade (9th, 10th, 11th, and 12th Battalions). Each of the naval battalions took the name of a famous admiral. In 1914 they suffered disaster at Antwerp, and during the night of 9th Oct. many men were interned in Holland. As a division they fought in Gallipoli, and, after the evacuation, working parties were performed at Stavros (Salonica front), the whole division subsequently embarking for France, where they captured Beaucourt (13th to 14th Nov., 1916) during the battle of the Ancre, and took a heavy share in the fighting until the Armistice (11th Nov., 1918), when they were on the Harmignies-Villers-St. Ghislain line, and still advancing. Cf. Fry and M'Millan, *The Complete History of the Royal Naval Division.*

The official intimation read: "Monday, 7th September, 1914.—After providing for all present and forseeable future needs of the fleets at sea, there remained available a large number of men belonging to the Royal Marines, Royal Naval Volunteer Reserve, Royal Fleet Reserve, and Royal Naval Reserve. A portion of these have been organized into one marine and two naval brigades, the whole comprising one infantry division, to be called the Royal Naval Division." The marine brigade was organized before the war and at this time had already been in action at Ostend.

Naval Reserve (Royal). See *Navy.*

Nav′an, a town of County Meath, Ireland, 30 miles from Dublin, at the junction of the Boyne and Blackwater; a railway junction on the Midland Great Western and Great Northern Railways. It has a woollen-factory and several flour-mills. Pop. 4000.

Navarre (Sp. *Navarra*), a frontier province of Northern Spain. The southern district lies in the valley of the Ebro; the northern district is rugged and mountainous, lying on the slopes of the eastern spurs and outlying ranges of the Pyrenees and the Cantabrians. All the rivers excepting the Bidassoa drain to the south, where they join the Ebro. The mountains are afforested; wheat, maize, wines, oil, flax, and hemp are produced; cattle and sheep are reared; freshwater fish are abundant. Pamplona is the capital. Area, 4055 sq. miles; pop. (1919), 316,141.

Navarre, a former kingdom extending over parts of France and Spain, but occupying mainly the region of the modern province. It arose from the emigration of Christian nobles during the Muslim conquest of Spain in the eighth century, and the first-known king was Sancho Iñiguez (905), whose grandson, Sancho III, 'the Great' (970–1035), became the most powerful Christian monarch in Spain. The Iñiguez dynasty came to an end by the death in 1234 of Sancho VII, son of Berengaria by Richard I of England. Blanche of Navarre, granddaughter of Charles the Bad, married John II of Aragon, who succeeded in 1458 and died in 1479, when Navarre passed to Catherine of Foix, who married the French Constable, Jean d'Albret. Jeanne d'Albret, daughter of Catherine, was the mother of Henri de Navarre, who succeeded to the French throne in 1589 as Henri IV. His father being Antoine de Bourbon, Henri was thus the first of the Bourbon kings of France. French Navarre was annexed to France in 1620; Spanish Navarre, which had been annexed by Ferdinand of Spain, ceased to exist apart from Spain after 1512.

Navel, or Umbili′cus, the aperture or passage in the abdomen which in the adult is normally closed, but in the fœtus or embryo gives passage to the umbilical vessels, by means of which the fœtus communicates with the parent through the placenta. The cicatrization or healing of the navel produces the contracted and depressed appearance so familiar in the external aspect of the structure.

Navel Ill and Joint Ill, in veterinary science, a complaint due to invasion of the umbilical cord or navel-string by septic organisms. Frequently the primary symptoms are not observed. They consist in loss of spirits and a disposition to stand and arch the back more or less. The teat is not sought, and an increasing indifference to surroundings presently ends in the young animal persistently remaining on the ground, stretched out and somnolent. Treatment is generally unsatisfactory, and prevention is merely a matter of tying the umbilical cord close up to the belly of the lamb, calf, or foal as soon as born, and the application to the dependent portion and to the immediate region of the navel of a mixture of 1 part by measure of pure carbolic acid with 11 or 12 measures of collodion or some other germicide.

Navicular Disease, a form of lameness in horses in which the small bone known as the navicular or shuttle bone becomes diseased. One of the tendons (' back tendons ') also shares in the disease. In its course inside the foot, this tendon passes under the navicular bone, which acts as a lever, but is separated from actual contact by an oil-sheath, or bursa, supplying oil to reduce the friction. Causes are various, but heredity is the principal one. The disease is found mostly in well-bred horses about five years of age and upwards. It is rare in draught horses. The fore-limbs are always affected, and no case is on record of the hind being affected. Diagnosis is not easy, and demands careful observation. Treatment is very difficult, and in advanced navicular disease nothing answers but the division of the sensory nerves by a veterinary surgeon, whereby feeling is cut off (neurectomy or neurotomy) and the animal does not go lame, although the destructive work continues in the foot.

Navigation, the science and art of finding a ship's position at sea, and of determining the proper course on which to sail to reach the port of destination. Near land, special methods are available, which come under *seamanship* (q.v.). In mid-ocean, two main methods are used in combination, ' dead reckoning ' and astronomical observation.

Dead Reckoning.—In this method, which is an important part of the routine of every ship, position is estimated from approximate knowledge of the distance travelled on a known course from a previous known position. The course is kept by the compass (q.v.), and to determine the true geographical course allowance is made for magnetic deviation (q.v.) and variation or declination (q.v.), as well as for leeway, or the effect of winds and currents; the leeway may be estimated by the eye, with the help of a diagram on the taffrail, as the angle between the ship's fore and aft line and her wake. The course and distance from a given point being known (see *Log*), the change in position has to be translated in terms of latitude and longitude. About latitude there is no difficulty. The speed in a direction inclined at a given constant angle to the (varying) meridian being given, the speed north or south is found simply by multiplying by the cosine of the angle, and the change of latitude is thus found in miles. The speed east or west is found by multiplying by the sine of the same angle; the distance that would be gone at this speed in the given time is the *departure*. The departure, however, does not give the exact change of longitude at once, unless the course is along a parallel (*parallel sailing*), in which case (change of longitude in miles) = (departure in miles) ÷ (cosine of latitude). In *plane sailing*, which may be used for short runs, change of latitude and departure are alone considered. In *middle latitude sailing*, the change of longitude is found from the departure by supposing the latitude of the above formula to be the latitude midway between the extreme values for the run. In the method called *Mercator sailing*, which is the most accurate method for long distances, the Mercator chart (see *Maps*) is used, actually or in principle. On this chart the course is a straight line beginning at a given point; the end point of the course can be found easily from the change of latitude calculated as explained above; and the new longitude is then read off the chart, or, more usually, calculated from a table of *meridional parts*, a table which embodies the same facts as are expressed graphically by the chart.

Astronomical Methods.—After a day's run the dead reckoning may easily give a result 5 or 10 miles out, and, unless the weather absolutely forbids, the navigator invariably checks and corrects his dead reckoning by the more refined methods of astronomy. His instrument is the *sextant* (q.v.), and what he observes is the *altitude* (q.v.) of sun, moon, or star. In order to get a clear notion of the exact amount of information given by a single observation of the altitude of a heavenly body, say a star, it is very useful to consider the star's *geographical position*, which is the point where the earth's surface is cut by the straight line from the centre of the earth to the star. Fig. 1 represents a section of the earth's surface by the plane through the star, the ship Z, and the centre of the earth C. X is the geo-position of the star, and EZH is its altitude. But since ZE and XF are practically parallel, the altitude EZH is the complement of the zenith distance DZE or ZCX, and ZCX in minutes of angle is the distance ZX in nautical miles. If the Greenwich mean time is known, the geo-position of the observed body may be found from the *Nautical Almanac*. Thus a single observation tells the distance of the ship from a known spot on earth, so that we know that she lies somewhere on a definite small circle of the terrestrial sphere. Hence if two sights are taken simultaneously, of two stars for instance, we can find two small circles on which the ship must lie, so that her position is fixed as at one or other of two known points, between which we can choose without ambiguity from the dead reckoning. It would hardly ever be practicable to carry this method out on a chart, on account of the great distances involved, but the idea of an observation defining a *position line* on which the ship must lie is of the highest importance, and is continually used in modern practice. Two special cases are particularly useful. (1) In a meridian sight, the position line, which is always at right angles to the body's bearing, is practically the parallel of latitude, so that a meridian sight gives latitude. (2) When the body is on the prime vertical, i.e. due east or west, the position line is practically a meridian, and the sight gives the longitude. The mathematics of sights on the meridian and on the prime vertical is very simple. Thus, in a meridian sight, even a rough knowledge of Greenwich time gives from the *Almanac* the sun's declination, i.e. the latitude of its geo-position; and the sight gives, as it were, the latitude of the same point relative to the ship, so that the ship's latitude is found by a simple addition or subtraction. In a morning sight, when the sun is due east, we find the longitude of its geo-position from the exact Greenwich time and the *Almanac*; and we find our own longitude relative to this geo-position from the observed distance between sun and ship, and the rough dead reckoning value of the latitude. The important facts that a noon sight gives latitude from a rough longitude, and that a morning or evening sight gives longitude from a rough latitude, are examples of the simple principle that the perpendicular distance from a point to a line is a *stationary* value, i.e. that a line a little off the perpendicular differs extremely little in length from the perpendicular itself. When the body observed is neither on the meridian nor on the prime vertical, a little more spherical trigonometry is needed. Thus, in fig. 2, if P be the pole, Z the ship, and X the sun or star (geo-position), the arcs being parts of great circles, we know certain parts of the spherical triangle PZX, the *position triangle*, viz.: (1) ZX ($= z$), the zenith distance of the body, or complement of its observed altitude; (2) PX($= p$), the polar distance, or co-declination of the body, found from the *Almanac*. We also know approximately (3) ZP ($= c$), the co-latitude, and (4) angle ZPX ($= h$), the *hour-angle* of the body, which is its longitude relative to the ship, or the ship's apparent time by the body regarded as the time-keeper; c being given by the dead reckoning latitude, and h by the dead reckoning longitude combined with information given by the *Almanac* when the Greenwich time is known. In a morning, or *chronometer*, sight, the rough latitude is sufficient to give a good value of the longitude, i.e. we find h from p, z, and c, when the sight is not more than 30° or 40° from the prime vertical. In a sight near noon (*ex-meridian*), the rough longitude gives a good latitude, i.e. we find c from p, z, and h. A morning chronometer sight of the sun is part of the daily routine of a carefully navigated ship. The longitude obtained, combined with the addition due to the run to near noon, as worked out on the chart, is then used to find the latitude by an ex-meridian sight. As a check, an observation may be taken of the sun's meridian altitude.

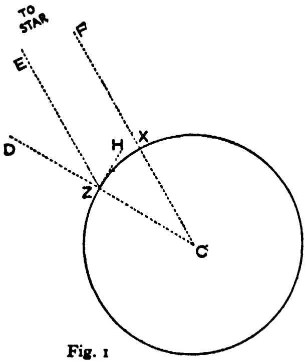


Fig. 1

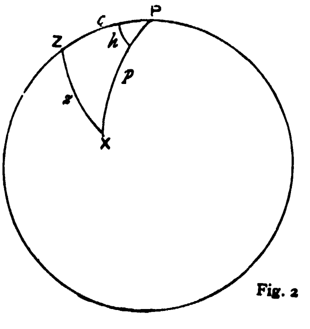


Fig. 2

An interesting method, really old, but not well known till some twenty or thirty years ago, is what is called the *new navigation*. Instead of using the rough dead reckoning latitude to get a fairly exact longitude, or vice versa, we take both latitude and longitude from the dead reckoning, and determine the corresponding distance of the geo-position of the sun by calculation. The true distance is known from the sight. If the calculated distance is, say, 10′ (i.e. 10 minutes of the meridian, or 10 nautical miles) less than the true observed distance, the position line through the dead reckoning position is 10′ too near the sun. The correct position line is therefore the line perpendicular to the sun's bearing, and 10′ farther from the sun than the practically parallel line through the dead reckoning position. Another sight is taken a few hours later and worked out on the same principle, the first position line being carried forward the proper distance to fit the run between the two sights. We have therefore two position lines at the time of the later sight, and the ship's position is fixed. Two sights taken simultaneously, and worked out by this method, give the *fix* at once. In good weather, with the sun at least occasionally visible, a navigator should find a fix within something like a mile of his position.

The place which navigation holds among the more exact sciences was won at a comparatively recent date. The great difficulty was always longitude. Latitude was easy to get, by pole-star or meridian sun, so that navigation in olden times was sometimes little more than a matter of getting on to the right parallel, and then sailing on due E. or W. till the destination turned up. The problem of longitude, at least from the astronomical side, is simply the problem of exact time-keeping, and this was not solved till the invention of the chronometer by John Harrison in 1735. (For the intensely interesting story of the prizes offered by the British Government for a solution of the longitude problem, and of Harrison's difficulties in making his claim good, cf. his life in the *Dictionary of National Biography*.) In spite of the development of wireless communication, it seems unlikely that the chronometer, constructed with the utmost refinement of mechanical skill, will ever cease to be an indispensable aid to scientific navigation.—BIBLIOGRAPHY: W. Hall, *Modern Navigation*; W. R. Martin, *Navigation*; Sir W. Thomson (Lord Kelvin), *Navigation: a Lecture*.

Navigation Acts, a collective term employed to denote a number of laws protecting British shipping interests and affording them advantageous privileges. By an Act passed in the twelfth year of Charles II, 1660, supplementing and confirming an Act passed by Cromwell in 1651 aimed against Dutch trade, it was enacted that no goods should be imported into England in any other than English ships, save when the goods were the genuine growth or manufacture of the country to which the ship belonged. The 12 Car. II further provided that the master and three-fourths of the mariners should also be English. Enactments of 1660 and 1663 confined colonial carrying trade to English bottoms, and was at the root of the American War of Independence. These prohibitions were retained until the adoption of the principle of free-trade, since when they have gradually been relinquished. In 1849 the restrictions on foreign shipping were repealed, except in regard to the coasting trade; the restrictions as to the manning of British ships were repealed in 1853; and in 1854 the coasting trade was thrown open to foreign vessels, subject to the same rules as British vessels.

Navy. *General Definition.*—A navy is an organization whereby a varying number of vessels are equipped and armed for war; and manned by specially trained crews of a strength sufficient not merely to handle the ships themselves, but to use the weapons they carry. With the progress of scientific knowledge navies have developed from comparatively simple beginnings into the most highly technical and complex aggregations of fighting force ever known in history, but the above general definition is applicable to all periods. At the present day all navies in the world are standing organizations composed of vessels which are the State property of their respective countries, and are manned by crews who are State servants while so employed. But up to the end of the sixteenth century, and even somewhat later, a portion of the navy of most maritime powers consisted during a period of hostilities of privately owned trading ships temporarily converted to belligerent purposes, and placed at the disposal of the State either voluntarily or compulsorily. Sometimes such ships were called upon to undertake all naval duties, including major operations; as, for example, in the case of those which were specially provided under statutory obligation by certain English seaports to assist in defeating the Spanish Armada in 1588. These vessels were included in the composition of the main fleets together with the ships of the Crown, and while so employed were under the direct orders of the Crown officers in command of the fleets in question. But as naval ordnance increased in size it necessitated an increasing specialization in the design of vessels built to carry an artillery armament, and owing to this change the temporary conversion of merchant ships no longer provided useful fighting units. And so it came to pass that during the seventeenth century the temporarily armed merchant ship disappeared from the main war fleets, and all fighting craft thenceforward were State-owned and State-manned, except those known as privateers. A privateer was a vessel of minor force fitted out at private expense to attack an enemy's trade with the object of private profit, but her status had to be legalized by written authority from the Crown or she was regarded as a pirate. She acted under no orders except from her owner as a general rule, and formed no part of the regular war navy of her flag. In the nineteenth century, however, privateering was abolished by the mutual consent of the principal maritime powers, and thereafter no privately owned vessel was permitted by international custom to carry an armament except for purely defensive purposes.

General Functions.—A navy—like an army—can only conduct operations in its own element, and, as it cannot enter and seize the domestic territory of an enemy, it is only useful for subsidiary purposes in the case of wars in which the opposing sides have practicable access to each other by land. But where they cannot reach each other except by sea routes the operations of the navies assume a first-class importance, and may even comprise the whole conflict. When a nation is acting purely on the *defensive*, under such circumstances the success of its navy is absolutely decisive; but if its war policy is *offensive* or conquering, victory on the sea has usually to be followed up by operations on the land, for which purpose the passage of its land forces across the water to the enemy's territory can be ensured by naval success alone. A navy therefore—if maintained on an adequate scale—is capable at all times of acting as a complete instrument of defence against the attack of an enemy who can only arrive by water; but it is not capable in itself of acting as an instrument of decisive conquest or aggression except under certain special conditions mentioned below. For example, the complete efficiency of naval defence against attack from oversea was illustrated by the defeat of the Spanish Armada, and the repulse of the many attempts to invade Great Britain that were made from time to time by France, but failed through the victories of Russell, Byng, Hawke, and Nelson. In some of these instances the invading army was actually embarked and suffered attack *en route*; in others it was assembled in readiness to cross when the fighting fleet had cleared the way. But in every case without exception the success of the defending navy wrecked the whole enterprise.

This power to defend naturally extends to all portions of a State which are only accessible to an enemy by sea. Thus it is that the distant parts of the British Empire such as Australia, New Zealand, Canada, and South Africa are secure against invasion while the British navy remains strong enough to meet any other, except that it cannot defend Canada against the United States. Similarly, the French colonies are safe against attack by any power which cannot first defeat the navy of France.

History has also proved that it is possible under favourable circumstances for a navy, operating defensively, to save the country to which it belongs from final defeat even after occupation by the army of an oversea enemy. The most notable instance of such an occurrence took place when the Japanese sent an army of a quarter of a million to invade Korea towards the close of the sixteenth century. The army crossed the intervening straits without opposition and conquered the whole land, but was cut off from home by the subsequently complete victory of the Korean navy over that of Japan. As Korea had been devastated by the land-war the Japanese troops were dependent on seaborne supplies from home, not only for reinforcements and munitions of war, but for food, and being unable to obtain them were compelled to abandon all the conquered territory and sue for peace, or accept the alternative of perishing by starvation.

As part of the general strategy of attack and defence it is also one of the functions of a navy to maintain intact the maritime routes connecting the various portions of its own State or empire, if these happen to be divided up by the sea, and to break up the corresponding connections of the enemy. If these connections are severed, it prevents concentration of land forces or munitions of war at any threatened point of territory. As comparatively recent examples of this, the defeat of the Spanish navy by that of the United States in 1898 prevented Spain from dispatching reinforcements or supplies to the Spanish garrisons in Cuba, Porto Rico, and the Philippine Islands, and the Spanish Government asked for terms of peace in consequence, and surrendered them all. Similarly, the rupture of the German sea communications with the German colonies in 1914 left the latter entirely dependent on their own resources for defence. On the other hand, the preservation of the Allied lines of sea communication by the superior power of the British navy enabled large contingents and supplies to reach Europe from the most distant parts of the British Empire, and permitted the French to bring their colonial troops across in safety from Africa. It is this function of the British navy of protecting sea communications that stands as the foundation of the whole system of imperial defence, for even the land frontiers of India, Canada, and the various portions of Africa and Palestine under the flag are dependent for security upon the power of the empire to send its troops by sea routes to their defence.

On the other hand, the inadequacy of a navy in itself to undertake a war of territorial conquest is frequently illustrated in history; for, except in the special circumstances mentioned hereafter, it does not necessarily follow that defeat on the sea brings sufficient pressure to bear on an enemy to compel a general surrender. Thus the British naval victories over the French were usually supplemented by military operations on the land, on a scale of varying importance from the landing of a few companies of troops to seize a West Indian island up to the employment of whole armies at Blenheim and Waterloo. Similarly, when in the wars with China and Russia the Japanese used their navy with entire success, that success did guarantee the safety of their own domestic territory, but was quite insufficient to attain their object in embarking on hostilities, which was the expulsion of their enemies from Korea and Manchuria. To that end naval victory was no more than a necessary foundation for further effort.

Given certain special conditions, however, a navy can finish an offensive war unaided by land forces; although such circumstances only arise when hostilities are the outcome of a purely maritime subject of dispute, or when the heart of the defending belligerent state is so situated as to be peculiarly vulnerable to naval assault. As examples of the first of these conditions may be quoted the succession of wars fought between Great Britain and Holland in the seventeenth century, which all broke out through a competition to obtain the maritime carrying trade of the world. Victory at sea ensured this in itself. Examples of the second conditions are afforded by the battle of Copenhagen and the naval attacks that were made from time to time on the sea capitals of the formerly existing Mahommedan states in North Africa, such as Blake's descent on Tunis and Exmouth's on Algiers. Here the main wealth and strength of a defending belligerent lay so immediately contiguous to the water as to be directly within striking distance of naval weapons.

But besides its functions in connection with the defence of its own national territory and the attack on an enemy's, the duties of a navy extend to the attack and defence of property on the sea, a form of operation which may on occasion produce a strong effect on the course and results of a war. In exercising this function a navy conducts hostilities under belligerent rights differing fundamentally from those which are generally recognized by civilized states as permissible in warfare on the land. An army cannot enter any foreign territory except that of an enemy without violating the rights of neutrals, and its sphere of operations is therefore very limited. Nor, as a generally accepted rule among civilized states, may the private property of enemy subjects be seized on the land without compensation. At sea, however, there are no geographical limits to the area within which a navy may strike its blows, provided that no act of war takes place within 3 miles of a neutral coast; and all enemy property, whether public or private, is legitimately subject to seizure except non-contraband of war carried on neutral ships. A navy may even seize the property of neutrals on the sea—under certain restrictions—if that property is on its way to the enemy's ports or ships.

This universally recognized right to lay hands on all vessels under a hostile flag, whether of State or private ownership, necessarily varies in its power to injure an enemy according to the extent of his dependence on his seaborne trade. In self-contained countries with a very limited mercantile tonnage such as the United States and Russia its effect is necessarily small, and the power of a navy to exercise formidable strategic pressure in that way is proportionately reduced. But if on the other hand a state is largely dependent for national prosperity on its seaborne trade its loss may be serious, and if this dependence is so extensive as to include necessaries of existence its loss may lead to consequences which are absolutely decisive. For example, the difficulties that beset Germany in the European War through the stoppage of external supplies of food and raw material were undoubtedly contributive to her ultimate downfall; and on the other hand a comparatively small addition to the shipping losses sustained by her enemies through the activities of her submarines would have certainly caused the downfall of Great Britain. The latter eventuality was only averted because the submarines were too few, in face of the measures devised to cope with them.

In a time of war the dispositions of a navy are naturally governed by the strategic situation of the moment, and in times of peace they are generally such as to meet the requirements of war with the least possible delay. In all countries a portion of the navy—usually consisting of the older ships, but sometimes with a proportion of the new—is laid up in home ports, either with partial crews or with no crews at all. On an outbreak of hostilities these are manned from the various naval depôts and categories of the reserve and sent to their war stations. The other portion of the navy is permanently kept in a fully-manned condition, as a precaution against sudden emergency and a means of training for officers and men. Thus, for example, more than half the ships of the British navy lie at the three great naval head-quarters of Portsmouth, Plymouth, and Chatham, either with nucleus crews, in which case they are grouped in squadrons under their own admirals, or unmanned altogether, in which case they belong to no squadron for the time, but remain under the custody of the authorities of the local Government dockyards. The other sections are mostly vessels of the newer types, and these are all fully manned without any reserve elements in their crews. Of these latter vessels the majority belong to the fleets whose movements, manœuvres, and general exercises and practices are carried out in or near home waters. The remainder are distributed on foreign stations, that is to say the Mediterranean, North America, China, South Africa, and East Indies. In Australia there is a small Colonial-owned squadron. Until the war of 1914 the disposition of the British ships on foreign stations was regulated by the disposition of that of the next strongest European naval powers, so that in the event of a sudden war with such rivals British trade in all seas should receive an immediate measure of protection. Thus, up till the end of the nineteenth century, the presence of a French or Russian ship in Asiatic, African, or American waters was always balanced by the neighbourhood of a British ship of approximately equal force; but when the German navy began to take rank in the early twentieth century as next to that of England, it was the German dispositions that received attention in a similar fashion. During the European War the whole navy was employed as the changes in the situation necessitated from time to time, and the majority of the ships on distant stations were recalled when the German cruisers had been destroyed, except those engaged in escorting convoys. But with the return of peace some reversion towards the practice of maintaining squadrons on foreign stations took place, although not under strategic necessity.

As a subsidiary or minor function it is the duty of all navies to prevent piracy at sea, although in modern times occasions for the exercise of that function are very rare. At the same time the mere existence of navies provides in itself an almost completely sufficient guarantee against the existence of pirates, and if all navies were abolished it is unquestionable that the present security of the seas would be materially reduced. To some extent armed ships also assist in protecting life and property in semi-civilized lands where local conditions render these insecure; but their ability to do so is necessarily confined to coastal regions and those bordering on navigable rivers, such as the seaboards of the Central and South American Republics and the main waterways of China.

Material Composition of Navies.—A fighting ship is built to carry the weapons of war of the period to which she belongs, in order to destroy enemy ships or such enemy property on the land as may be within her reach. From the earliest periods of naval history therefore her design has exhibited a parallel development to that of the weapons in question, and reflected the tactical principles of her era. In the ancient Greek and Roman navies the sword and spear were the chief weapons of combat, and no effective attack was possible until these could come into play by boarding the enemy. To facilitate this manœuvre speed and handiness were the prime qualification of the ancient war galley, which were obtained by a large number of oars, and special rudder power.

For the first fourteen centuries of the Christian era the true fighting ship remained a galley, specially designed to close and board the enemy under the motive power of oars; but the details of her construction were modified, and instead of the three tiers or banks of oars used by the Greeks she carried one only, in which each oar was handled by three rowers. Even when gunpowder began to revolutionize all war the mediæval galley only mounted one or two guns in her bow to fire ahead, as it was impossible to mount them on the broadside or beam without seriously reducing the number of oars and losing speed. But by that time the great art of sailing to windward had become known, which revolutionized all navigation by enabling ships to dispense with oars altogether, and thereby to mount guns on the broadside in considerable numbers without interfering in any way with their power of movement. This sealed the fate of the galley as a fighting type; for when she tried to close and board a vessel so armed, the latter simply manœuvred to cover her approach and then raked her fore and aft. All tactical ideas therefore underwent a complete change, and it was to English seamen that the change was chiefly due; although by the end of the sixteenth century their lead had been followed in all the principal navies, and the broadside artillery armament had become the true standard of offensive and defensive power. At first it was carried on the upper deck level only; but as ordnance increased in size it became necessary to carry it lower, which was rendered possible by the invention of ports permitting the guns to be pointed through the ship's side instead of over it. To mount a battery thus, however, an interior deck had to be added to the structure of the ship, which with the guns themselves interfered so seriously with the space available for cargo that from that period the temporarily armed merchant ship ceased to be a match for the specially built ship of war, and disappeared by degrees from the main fighting fleets.

For three hundred years from the latter half of the sixteenth century all navies consisted of ships built of wood, moved by the wind, and armed on the broadside; and it was with this embodiment of certain tactical ideas that the

British fought their way to the premier maritime position in the world, by defeating the Spaniards in the sixteenth century, the Dutch in the seventeenth, and the French, Dutch, and Spaniards combined in the eighteenth. The reign of this type was of very great historical importance, coinciding as it did with the making of modern Europe, the populating of America by the white man, and the opening of the East to direct sea trade. But although in its general conception the application of the type was extensive and enduring, considerable differences were to be found in the size and force of the individual ships, not only from one period to another, but in those of contemporary production. This was due in the first place to the varying requirements of war. For such duties as scouting and the attack and defence of trade, small vessels were quite as efficient as large, and a much greater number could be built at the same cost. Thus in all navies a variety of sizes prevailed in the individual ships from the earliest adoption of artillery mounted on the broadside system.

It was in the seventeenth century that the first notable advances were made in size and in details of design by the introduction of a second battery deck in the larger vessels forming the main battle force, to be followed eventually by a third. But although the three-decker represented the extreme concentration of fighting power in one hull, she had the tactical disadvantage of being as a rule slower and less weatherly than her smaller consorts of two gun-decks only, and the latter type invariably predominated in all navies in a proportion of ten or twelve to one. Both classes were known after the seventeenth century as ships-of-the-line. Next in size to the ship-of-the-line came the vessels with one tier of guns only below the upper deck, and next to these again the smallest classes which carried all their armament on the upper deck. The former were eventually designated frigates, and the latter corvettes and sloops according to force. The frigates were the fastest sailers of all, and a certain number nearly always accompanied large battle fleets as scouts. From corvettes up to ships-of-the-line all sizes carried an identically shaped sail plan, on a scale varying with tonnage, which was set on three masts with three yards on each and known as the ‘ ship rig ’. In the early nineteenth century a fourth yard on all masts was added. A few of the sloops were similarly rigged, but the majority had only two masts, and were either brigs or schooners. The smallest of all were cutters. With the passage of time the typical ship of every class presented an ever-increasing size. Thus while the earliest three-deckers carried only 90 guns, the last to be launched carried 131. Similarly, the two-decker armaments increased from 60 to 90, and the frigate armaments from 36 to 50. Moreover, the guns increased in size and destructive power as well as in numbers. Until long after the Napoleonic wars the standard line-of-battle weapons were 24- and 32-pounder smooth-bore guns firing solid round-shot, but by 1840 the 68-pounder had been introduced, and a few years later shells had been invented.

Continual improvements in ordnance sealed the doom of the wooden broadside ship-of-the-line in favour of entirely new types of fighting craft, but before that happened a revolutionary change had taken place in her motive power by the introduction of steam machinery. It was first installed as an aid to sails only, but within twenty years, that is to say by 1860, it had been extended to all ships that were classed as effective for war, as their fighting source of movement. Thirty years after its first application to vessels in the British navy it had become the principal instead of the auxiliary moving agency of the whole fleet, and twenty years later again sails had disappeared in all modern ships of every size and force. The transition was thus completed in half a century.

The great era of evolution in weapons which entirely changed the forms of naval architecture began about 1860. Shell-fire had proved so destructive in the Crimean War that some method of mitigating its effects came to be regarded as imperative, and resulted in the application of armour to the sides of a new type of ship. Moreover, as guns increased threefold in weight within a very short period, it was structurally impracticable to build ships capable of carrying the same large numbers as were in use in the older designs, with the added burden of armour. The three-decker and two-decker disappeared therefore to make way for a single-decked class carrying no more than one-fourth as many weapons, but of a vastly more powerful pattern, and protected by armour. The decisive superiority of this novel design received conclusive demonstration in the American Civil War, and at the Austro-Italian battle of Lissa, the last occasion on which a ship-of-the-line of the old style ever went into action. Armour thenceforward became an invariable feature in every ship built for the battle-fleet duties of the former two- and three-deckers in all navies of importance. But the ever-increasing size of guns still went on, decreasing the number a vessel could carry, even with a great increase in tonnage, and stimulated efforts to find methods of putting them to the utmost use. In a broadside ship only the weapons on one side could be engaged at one time, unless under very unusual circumstances. Half the armament of such a ship remained idle therefore even in battle. To overcome this grave objection yet another new type of vessel appeared, known as the turret-ship. In this design the original practice of carrying all the armament on the upper deck was revived, but the guns were mounted on the centre line of the deck in revolving armoured turrets so as to be able to fire over either side. In this way the entire armament could always be brought into action instead of only a half, and a turret-ship with only four weapons could engage a broadside ship with eight on equal terms. The broadside principle of mounting thereupon stood condemned, and after 1878 no broadside ships were added to the navy except in the smaller classes. Some years before that came to pass smooth-bore ordnance had been completely replaced by rifled, although breech-loaders were not adopted till 1880, and muzzle-loaders had not entirely disappeared till near the end of the century.

The centre-mounted armament vessel thus became the successor of the old ship-of-the-line, and received the official designation of battleship. For more than sixty years the development of the type has been continuously progressive in every feature. The displacement of the largest armoured designs has increased from 4000 to 40,000 tons; their speed from 9 to 28 knots; the weight of their heaviest gun from 6½ to 98 tons. Armour increased in thickness from the original 4 inches to 2 feet within fifteen years, to meet the increasing penetrative power of ordnance; and subsequent improvements in its metallurgical treatment during preparation have more than trebled its resisting strength, so that although its thickness has now receded to a maximum of 13 inches, that gives a protective efficiency equal to 3½ feet of the wrought iron with which the first armoured ships were cased. In 1875 Whitehead torpedoes were included in the armament of all battleships building, and as a protection against under-water attack their internal subdivision was increased till it is now tenfold greater in proportion to tonnage than in the first subdivided vessels.

Another innovation of this period was a structural alteration whereby a ram took the place of the old-fashioned bow in all new types built for the line of battle, and some of the smaller classes also. This idea, whereby the hull of a vessel itself became a weapon, had a temporary success at Lissa owing to the bad gunnery of the rammed ships in defending themselves, which gave the ram an undeserved reputation, for it never again played any part in war, and proved a fruitful source of danger to consorts by aggravating the effects of accidental collision.

Speaking generally, all these great advances in fighting designs were only rendered possible by the radical change in shipbuilding material, first from wood to iron, and then from iron to steel, which began in the British navy from the early 'sixties. The limit of size in wooden hulls had been reached, and only on an iron or steel basis could tonnage be increased and rigidity ensured so as to meet the constantly growing weight of armour and guns. But about ten years after the introduction of iron shipbuilding and armour a more important and far-reaching change than any above mentioned was on the eve of its appearance, in the new science of under-water attack by such entirely novel weapons as the torpedo and the mine. Before their invention no vessel had anything to fear from any invisible form of danger, and the war value of every craft afloat was measured solely by her guns. After their invention the whole theory of naval warfare based on the undisputed supremacy of heavy ordnance in big ships was seriously and increasingly challenged, and in the great wars which followed vastly more loss was occasioned by under-water weapons than by the gun.

The chief difference between the torpedo and the mine is that the former is a moving weapon and the latter a stationary obstacle. The Whitehead torpedo was invented about the year 1870, originally in the form of a surface boat driven by compressed air, and carrying a charge in the bow to explode on striking a ship's side; but by an important early development the boat was replaced by a cigar-shaped shell of steel, which ran below the surface by a device of horizontal rudders actuated by hydrostatic pressure according to depth. This self-propelled weapon was ejected in its earlier days from a wheeled carriage on deck if used from a ship, but afterwards from an under-water tube, and if used from a boat simply by dropping into the water. Another form of torpedo which proved effective in the American Civil War and Russo-Turkish operations was simply an explosive charge carried at the end of a long spar projecting from the bows of a steam launch or pinnace; but the introduction of quick-firing guns rendered the close approach of the boat impossible, and the spar torpedo became obsolete. The mine is an anchored explosive charge floating at a set depth under water in an iron or steel case, usually of spherical shape, which explodes on being bumped; but it can only be used in moderately deep water, for otherwise the weight of the mooring cable is too great for its buoyancy. It can be removed by a sweep, which consists of a wire cable dragged between two small vessels such as trawlers, or by a paravane, which is an apparatus shaped like a Whitehead torpedo with vertical planes, and towed from near a ship's bow. The planes are acted on by the pressure of the water as the ship moves ahead in such a way that the paravane tries to diverge outwards at an angle and tautens the towing line. If the line then strikes the moorings of a mine, it pushes the latter clear of the ship into a cutter fixed to the paravane, which severs the moorings and allows the mine to rise to the surface. All large ships are now fitted with these.

The invention of the Whitehead torpedo produced a weapon whereby the smallest-size ship had a chance to destroy or disable the largest, and brought two new classes into existence specially for its use, namely the torpedo-boat, which was a very fast small surface craft, and the submarine, which attacks entirely submerged. To deal with torpedo-boats a larger type on the same general lines was introduced with a combined torpedo and light-gun armament, and designated the torpedo-boat destroyer. Before many years had passed she had rendered the torpedo-boat obsolete and taken her place as a surface torpedo craft. The torpedo-boat destroyer is also one of the most effective enemies of the submarine.

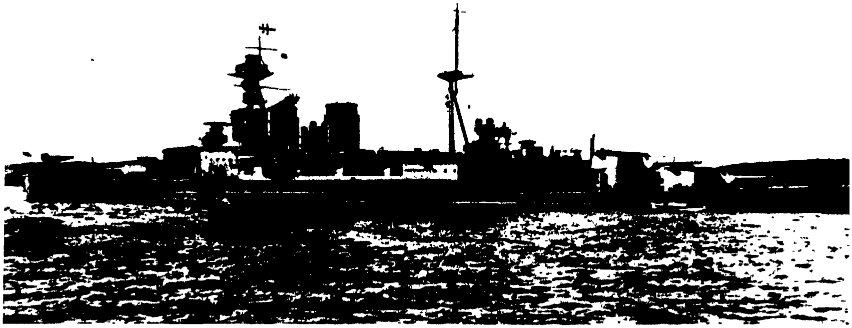
Submarines of a practically useful design were first built in France, and first adopted in the British service at the beginning of the present century. In all submarines the general principle is that of a vessel which can be submerged to any desired depth by the admission of water to compartments known as ballast tanks, and by the downward pressure of horizontal rudders or hydroplanes. To rise again the rudders are turned so as to press upwards, and the water in the tanks blown out by compressed air. Propulsion when submerged is effected by electric engines to avoid combustion in an enclosed hull, and surface propulsion by petrol or steam. One or more guns are usually carried for surface action in addition to several torpedo tubes for attack when submerged.

Frigates, corvettes, and sloops, armed on the broadside, and built either entirely or partially of wood, survived the wooden ship-of-the-line by about twenty-five years; but were gradually replaced by iron or steel successors known by the general term of cruisers. Cruisers varied very greatly in size and armament for thirty years after their first appearance, ranging from 1500 to 15,000 tons in displacement; but in all high speed was a special feature. In later types armour was carried, but even the most powerful cruiser was never quite a match for a contemporary battleship. Since 1907 the armoured cruiser has been gradually superseded by a new type designated the battle-cruiser, and is now no longer represented in the British navy. The battle-cruiser carries the same calibre armament as the contemporary battleship proper, and equals or even exceeds her in tonnage; but her guns are fewer and her armour lighter, which enables her to carry more powerful engines and attain a somewhat higher speed. In dimensions and fighting force she bears much less resemblance to a true cruiser than to a modern line-of-battle unit, and on this account she is included in the category of 'capital ships', under which term all such units are grouped. The modern unarmoured or light cruiser carries her guns on the centre line instead of the broadside, a great improvement in tactical efficiency. As compared to the modern capital ship her fighting force presents a good parallel to that of the frigate when compared to the three-decker. One other new class of vessel has been added within a very recent period to the composition of every fully equipped navy, and that is the aircraft carrier, which, as her name implies, is designed to carry the scouting seaplanes playing an important part in modern war. To provide the necessary deck area for the aircraft to alight on, the aircraft carrier is necessarily a large vessel of battleship dimensions.

Space does not permit here of a detailed description of the developments in naval propelling machinery since the introduction of steam, but it corresponds roughly to that in the mercantile marine, from simple to compound reciprocating engines, and thence to direct-acting and geared turbines. Boilers have passed from the rectangular low-pressure pattern to the high-pressure cylindrical, and thence to the water-tube. Oil fuel has completely superseded coal in the British service, after a transition period in which both were used.

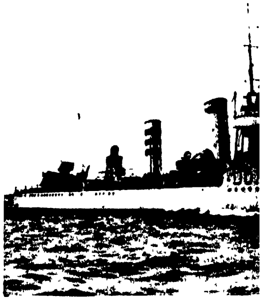
The ships in the British navy are all British built and armed, being constructed in the Royal Dockyards at Portsmouth, Plymouth, Chatham, and Sheerness, or by contract; and their repairs and overhaul were formerly carried out under similar arrangements, but are now entirely undertaken in the royal establishments. Here also all equipment, armament, and stores are maintained in stock. Ships on foreign stations are kept in repair in H.M. Dockyards at Malta, Gibraltar, Hong-Kong, Bermuda, and Simon's Bay; those of the Australian navy in the Commonwealth Government yard at Sydney.

An exact statement of the numbers comprising a modern navy does not convey an accurate impression of its true war value, because a proportion of the whole—which continually varies—consists of ships which are obsolete and comparatively useless except for subsidiary duties. In the era of the wooden broadside type designs changed so slowly, and hulls built of seasoned timber lasted so long, that ships often remained fully efficient for war for half or even three-quarters of a century, and required little attention when lying up in reserve; as they sometimes did for twenty years after being launched, before going to sea at all. But since 1860 designs have

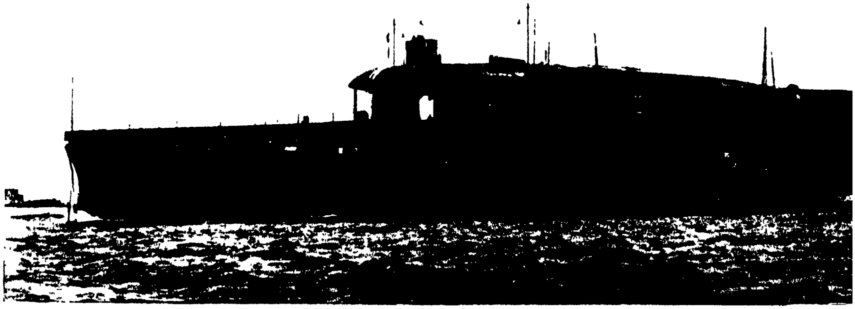


H.M.S. *Hood*, Battle Cruiser

"X" Class Submarine

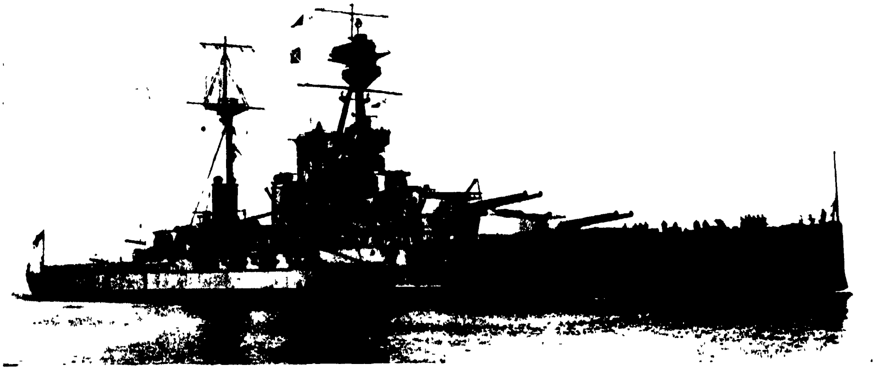


H.M.S. *Wishart*, I

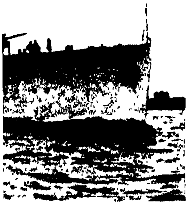


H.M.S. *Furious*, Aircraft Carrier

BRITISH NAVY

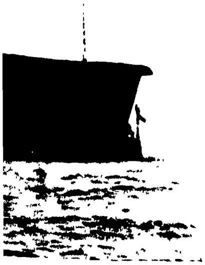


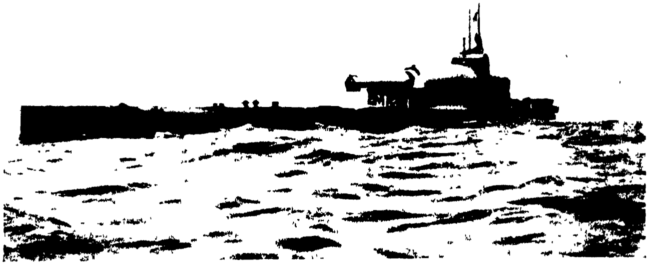
H.M.S. *Royal Sovereign*, Battleship



W" Class

H.M.S. *Dragon*, Light Cruiser of "Dauntless" Class





"M" Class Submarine

changed so rapidly that in ten or fifteen years a vessel has ceased to count as up-to-date. Being, moreover, very intricate machines, liable to rapid deterioration even when not in use, they get worn out in a third of the time of their more simply constructed wooden predecessors. Taking effective ships only, therefore, the numbers given below represent a fair approximation to the actual war strength of the British navy in 1922:

(*a*) *22 capital ships.* These carry armaments varying from eight guns of 13½-inch calibre to eight of 15-inch, and range in size from 25,000 to 41,000 tons, and in speed from 21 to 31 knots. Four are battle-cruisers.

(*b*) *40 cruisers.* These carry armaments varying from five 6-inch to seven 7½-inch, and range in size from 3750 to 7500 tons, and in speed from 25 to 32 knots.

(*c*) *190 surface torpedo craft.* These include twenty-four flotilla leaders, all the remainder being destroyers. They carry from four to six tubes and a light-gun armament, and vary in size from 880 to 1800 tons, and in speed from 34 to 37 knots. All are fitted with depth charges for destroying submarines. A few are fitted as minelayers and carry no torpedoes or guns.

(*d*) *70 submarines.* These vary in surface displacement from 420 to 1880 tons, and in surface speed from 15 to 24 knots. They are fitted with from four to eight torpedo-tubes. Three carry a 12-inch gun, but the remainder a light-gun armament only.

In addition to the above four categories there are other classes necessary in war for auxiliary duties; for certain of which classes a nucleus is maintained permanently for emergencies, and the balance drawn from the mercantile marine as required during hostilities. These consist of armed merchant cruisers, sloops for convoy work, minesweepers, and patrol craft. In 1922 about twenty-five effective sloops and fifty-five minesweepers were on the permanent list. Destroyer and submarine flotillas also have depot ships which are not fighting units. For other special peace duties the Admiralty maintain eighteen river gunboats, nine surveying ships, and sundry other vessels.

Battleships and cruisers in commission are usually organized in squadrons of four to eight ships; destroyers and submarines in flotillas of eight to twenty. A combination of squadrons and flotillas with auxiliary ships makes up a fully constituted fleet.

Organization of Naval Personnel.—The crew or ship's company of a vessel manned for war differs from that of a vessel employed in trade through the necessity of carrying enough men to use her armament in addition to those required for moving and handling her. In the earliest periods of naval history these two elements were separate. Later they were combined, and later yet separated again. Thus in the days of war galleys the oars were handled by unarmed men, whose duty was confined to moving the vessel into position for the fighting section to attack. This division of responsibilities lasted right down to the late Middle Ages, only disappearing when the motive agency of oars had been finally abandoned in favour of sails, and broadside artillery fire had become the accepted method of engaging an enemy. Even then in some countries such as Spain the distinction between the fighters and the seamen survived for a time. But in England the seaman was also the fighter from the Tudor period. This combination of duties lasted for about three centuries, and coincided with the greatest era of British naval history. Then with the advent of steam propulsion the ancient principle of separating the fighting portion of the crew from the portion employed to drive the ship was revived, and remains in force in all navies except that of the United States, in which the same officers do duty in both branches.

In the constitution of the *personnel* of a navy there is necessarily a graded sequence of rank and responsibility just as in any organization maintained for war. A ship is under the immediate command of an officer whose rank corresponds to her importance as a fighting unit, and the aggregations of ships which are known as fleets or squadrons, according to size, are commanded by officers of a higher rank bearing the title of admiral—with a distinctive prefix—and designated collectively as *flag-officers*, because any ship carrying one flies a special flag to denote the fact. The British navy has four grades of flag rank, known respectively as admiral of the fleet, admiral, vice-admiral, and rear-admiral. Next in order of authority to flag-officers come captains, commanders, lieutenant-commanders, lieutenants, sub-lieutenants, midshipmen, and naval cadets. A temporary rank known as commodore also exists, which comes between rear-admiral and captain, and is held by captains while occupying certain appointments. All above midshipmen are commissioned officers. These constitute the executive branch as distinguished from the engineer, medical, accountant, and Royal Marine branches of the service; and no officer unless of the executive branch is competent, or permitted by the regulations, to command a ship. To hold commissioned rank in the executive branch an officer must first have qualified by examination in the navigation and handling of a ship, and in all the principal technicalities of the seaman's profession; and must also be trained in the use of naval armaments. In the United States navy the executive branch—or *line branch* as it is called in America—also carries out all the work of the engineers.

but in the British service they are only trained in the general theory and practice of engine-room duties.

Entry into the executive branch of the British navy is made by passing first a board of selection and then a qualifying examination. The candidate then becomes a naval cadet, and spends a period of elementary professional instruction in the Royal Naval College at Dartmouth. Thence he is sent to sea, and serves for a term of years as naval cadet and midshipman, to complete his professional training. At the conclusion he is examined in seamanship, and then passed through special finishing courses of instruction at the various naval educational establishments such as the gunnery, torpedo, and pilotage schools, and the Royal Naval College at Greenwich, at each of which he undergoes examination. If successful he is considered professionally qualified for command, and receives a sub-lieutenant's commission. Thenceforward his future advancement is dependent on selection for each step up to the rank of captain, except that as a lieutenant of eight years seniority he automatically becomes a lieutenant-commander. From captain upwards through each of the first three grades of flag rank all promotion is by seniority, but it becomes selective again for the highest rank of all, that of Admiral of the Fleet. An officer who reaches the age of 55 before arriving at the top of the captains list is obliged to retire. A rear-admiral must retire at 60, a vice-admiral or an admiral at 65, and an admiral of the fleet at 70. Retirement is also compulsory in all these ranks if an officer remains unemployed for a certain period varying with rank.

In the British service up till the seventeenth century none were permanent servants of the Crown if below captain's rank. A list of so-called king's captains was maintained by the Lord High Admiral, from which all commanding officers were selected. When not actually employed afloat, these officers received a retaining salary known officially as half-pay, in order to compensate them for their disability to undertake other kinds of employment. An officer below the rank of captain was merely engaged for the period in which the ship in which he held rank was in commission, that is to say manned and equipped for State service with a captain in appointed command. At the end of the commission he was discharged with the ship's company, and the Crown had no further call on him unless he voluntarily rejoined. By degrees, however, the system of a retaining allowance was extended to other ranks, and before the nineteenth century it included all commissioned officers of the executive branch. Under both the old and the new systems, when an officer was or is appointed to a ship his name is inserted on her ledger for full pay, and he is said to be 'borne on her books'. On full pay he exercises all the authority of his rank as laid down in the regulations, and is himself subject to the provisions of the Naval Discipline Act.

In all navies of importance a certain selected proportion of the executive officers of commander's, lieutenant-commander's, and lieutenant's rank receive an extended training as specialists in separate technical sections of the science of war. In the British navy these are known as gunnery, torpedo, war staff, navigating, and signal officers. War staff officers undergo a comprehensive instruction in naval history, strategy, tactics, and war administration, and carry out war staff duties.

In addition to the executive officers, all navies are provided with other branches of commissioned rank, but of non-seaman character, that is to say the engineers, surgeons, and paymasters. Of these the most important are the engineers, although in different navies there is a great variety in the status they occupy. In the United States Navy their duties are considered so essentially a part of the war efficiency of a ship that they are entrusted to the executive or 'line' branch, and in that navy there are no separate engineer officers, an arrangement which works very well. In the British navy the engineers are entered as naval cadets with the executives, and the earlier stages of their service is precisely the same. Not till they reach commissioned rank does the separation begin, and after that their duties lie apart, but their ranks correspond up to vice-admiral. In other navies the engineers are quite a separate branch from the start of their career, and the number holding commissioned rank is small. All navies are supplied with medical officers, who are responsible for the health of the men as their designation implies; and most navies possess an accountant or paymaster branch, who carry out all clerical work connected with payment, victualling, and clothing; keep the records of service of every man borne on the books; and conduct the secretarial duties required in the official correspondence of flag and commanding officers. Large vessels in the British navy also carry a chaplain of the Established Church of England, and a naval instructor for the midshipmen.

The British and United States navies differ from all others by including in their composition a section organized on a military basis and holding military instead of naval titles of rank. These are the Royal Marines and the United States Marine Corps. With officers of the Royal Marines the terms of service, the training, the system of authority and responsibility, and the uniform, are military rather than naval.

They are only subject to naval discipline when actually afloat, and at other periods are quartered in barracks under the local military authorities. Unlike naval officers, they are not dependent for full pay on being borne on the books of a ship. But they are trained in naval gunnery, war staff duties, and wireless telegraphy.

Next in authority to the officers who are officers from entry, and eligible for promotion to the highest ranks, are those who rise from the lower deck and are designated collectively as warrant officers. In their case advancement ends at a rank which is equivalent to that of lieutenant. In the British navy eligibility to become warrant officer on passing the necessary tests has been extended within recent years to all the various sections of the lower-deck *personnel*, including the engineering, nursing, accountant, victualling, telegraphist, and educational elements, as well as the combatant and shipwright, and the system now prevailing has become too complex for description in a general article; but the warrant officers of most importance to the war efficiency of a navy are the gunners, torpedo gunners, boatswains, shipwrights, and engineers. The duties of these officers are largely concerned with the custody, repair, and maintenance of armament, equipment, and stores.

The officers in general form the supervising body under whom the crew or ship's company of a fighting vessel carry out their various duties. In the British navy those who are not officers are not officially known as holding a ' rank ' but a ' rating '. Broadly speaking the ratings forming a ship's company may all be divided into the fighting and engine-room sections, for although a certain proportion are neither seamen nor stokers nor trained to the use of arms, such as the writers, wireless telegraphists, cooks, stewards, sick-berth staff, &c., every one of these has his station in action either to pass up ammunition, attend to telephones, read the fire control instruments, or assist the wounded.

The system of grading a ship's company varies in different navies, but not greatly. In the seaman branch of the British service the sequence of ratings is chief petty officer, petty officer, leading seaman, able seaman, ordinary seaman, and boy; and in the stoker and other branches it is approximately correspondent except that there is no equivalent rating below that of ordinary seaman. In most foreign navies a proportion of the hands are recruited by compulsory service, but in the British and United States navies all are voluntarily recruited except in abnormal times, when the whole male population is subject to conscription, as in the European War. In the eighteenth and nineteenth centuries the British seafaring population was also liable to seizure by impressment for service in the navy if the requirements of war were not adequately met by voluntary entries. In most navies a proportion of the men who enter voluntarily are allowed to engage for a long period, and from these the petty officers are usually selected; but the remainder, and all those who enter under compulsion, are only required to serve for short terms. When continuous service was first established in the British navy, however, all ratings entered under this new method were under an equal obligation to serve for ten years, and at a somewhat later period this was raised to twelve. At the expiration thereof smart men of good character were permitted, if they so desired, to re-engage for ten years more; and at the completion of this second term they were discharged on pension. Members of the seaman branch were entered as boys in the royal training ships, where they were prepared for the navy, but all other branches were entered direct for sea service.

In its main features this system has remained in force for about sixty years since its first gradual adoption; but certain modifications have taken place. Early in the present century the advantages of manning a navy in part by entering a percentage of the ratings for short service under the pennant, followed by a term of years in a permanently organized reserve, attracted the attention of the Admiralty, especially after the great success of the partially short-service fleet of Japan in its war with Russia. A revised arrangement was therefore adopted whereby a proportion of the entries were only required to serve five out of their twelve-years engagement actually afloat, and then passed for the remaining seven into a new organization designated the Royal Fleet Reserve, in which they received a retaining pay and remained liable to be called up for service whenever required. It was on this combination of long and short service that the British navy was manned on the outbreak of war in 1914, and it still stands in force in 1922.

At the close of the war extensive reductions were necessary, and these had brought the total *personnel* down to approximately 98,000 by 1922, inclusive of Royal Marines. All are divided for administrative purposes among three main divisions, known as port divisions, of which the respective head-quarters are the naval depot barracks at Portsmouth, Plymouth, and Chatham. On entering any branch of the navy a recruit is detailed to one of these divisions of the service, and belongs to it permanently until his final discharge, no matter where he may be employed while wearing naval uniform. Having passed the medical and other tests, and been accepted for entry, he is sent to the depot barracks of his division to await drafting to sea, and to these same barracks he returns on each occasion of his ship being paid off, there to await orders as to joining another. In the seaman branch, however, a boy is not detailed to a port division till he has finished his time in the training ship, nor does his twelve-year period of engagement begin to count till he is an ordinary seaman. At Portsmouth, Plymouth, and Chatham, in addition to the divisional depot barracks, are established a gunnery and a torpedo school for passing men through the necessary training of the combatant branch on first entry, and to re-qualify in the latest improvements after each period of service afloat. At each port are also barracks for the local division of Royal Marines. When the Admiralty decide that a ship is to be commissioned—that is to say, manned for service either with a full or a partial crew—either on completion as a new vessel, or after lying up in charge of the dockyard authorities for a time, the commander-in-chief at the port where she lies is instructed to detail a ship's company for her from the depot barracks of the local port division on a given date. The captain and officers are appointed to join on the same day by the Admiralty, and the ensign and pennant are hoisted, the latter being the captain's emblem of command. In a vessel to carry an officer of flag rank, an admiral's flag takes the place of the pennant. When manned and ready for sea in all respects the ship sails to join her squadron, unless she has been commissioned with a partial crew only, in which case she remains at her port in reserve. When commissioned for foreign service a ship usually retains her crew without any change—except in minor details—until she returns home, or until the whole crew is relieved by a fresh crew at the expiration of two years if she is to remain abroad. But if commissioned for service in home waters she usually discharges a proportion of her crew annually to the depot, and receives thence a fresh draft in exchange. By this means the periods of foreign and home service are roughly equalized for all ratings in the port division.

In addition to the Royal Fleet Reserve, the British navy differs from foreign services in having three other categories of reserves, namely the Coast Guard, the Royal Naval Reserve, and the Royal Naval Volunteer Reserve. The Coast Guard is composed of naval ratings who have completed a period of their service with the fleet and been selected for transfer to carry out coast watching, preventive and life-saving duties.

The Royal Naval Reserve stands on a different footing altogether, inasmuch as neither officers nor men have ever belonged to the regular navy, although they must be professionally competent for seafaring employment either on deck or in the engine-room. As a guarantee of fitness the officers must hold the Board of Trade certificates required in the mercantile marine, and the ratings must be noted in the Registry of Shipping as seamen or stokers by trade. The Royal Naval Reserve has three branches of officers, namely the executive, the engineer, and the paymaster; and two branches of men, the seamen and the engine-room. Entry is subject to special tests, and promotion is by selection. The ratings engage for five-year periods, which can be repeated if character is satisfactory. To impart a training for war, officers and men have to attend annual or biennial courses of instruction and drill in ships of the navy, and while so employed receive full pay; to which at other times is added a retainer under certain conditions. A separate branch is solely devoted to mine-sweeping, in which the officers must be qualified for trawler command, and are granted a special warrant rank designated skipper, which places them on a list of their own.

The Royal Naval Volunteer Reserve is another body consisting of men who have not served in the navy itself originally; but they differ from the Royal Naval Reserve in receiving no retainer, and being dependent on no professional attainments for entry. Very few are of regular seafaring occupation, but a proportion of the officers are amateur yachtsmen qualified by Board of Trade certificates, and competent to command small craft such as trawlers and motor-launches. These form the auxiliary patrol in war.

The whole control and administration of the British navy is theoretically in the hands of the Lord High Admiral, a great Officer of State, but for more than two centuries his duties have been entrusted to a board known as the Lords Commissioners of the Admiralty. At the head of this board sits a cabinet minister known as the First Lord, who collaborates with six naval officers of senior standing and two civilian members of Parliament. The responsibility of the board is collective, but by custom the senior of the naval officers—who is known as First Sea Lord—attends to all matters concerned with the peace and war distribution of the navy, assisted by the Fifth and Sixth; the Second attends to all duties connected with *personnel*; the Third to every matter connected with the building, maintenance, equipment, and armament of ships; and the Fourth to the provision and issue of stores and supplies. One civilian member deals with the financing of the navy in its parliamentary aspects, and the other attends to all questions connected with Admiralty works on land, such as docks, workshops, naval barracks, &c.

The entire authority of the Board of Admiralty and of every officer and petty-officer in the British navy is founded upon the parliamentary statute known as the Naval Discipline Act. This embodies the Articles of War—setting forth the general principles of disciplinary obedience—the legal procedure for courts-martial, and a code of punishments. It empowers the Admiralty to issue all necessary instructions for the administration of the service; and such of these as are of a standing nature are included in an official volume designated the *King's Regulations and Admiralty Instructions*, copies of which are on board every ship in commission. As the British navy is a constitutional force, the Naval Discipline Act does not require annual parliamentary sanction like the Army Act, but remains on the Statute Book until its entire revision by a fresh Act is considered nationally desirable, with such lesser amendments as changing circumstances may from time to time render expedient. The existing Act dates from 1869, and except in minor details has undergone little alteration.—BIBLIOGRAPHY: *King's Regulations and Admiralty Instructions*; F. T. Jane's *Fighting Ships*; Sir J. S. Corbett, *Drake and the Tudor Navy*, and *England in the Mediterranean;* Vice-Admiral G. A. Ballard, C.B., *Influence of the Sea on Political History of Japan*; H. W. Wilson, *Ironclads in Action*; Captain A. T. Mahan, *Influence of Sea-Power on History*, and *Influence of Sea-Power on French Restoration and Empire*; *Brassey's Naval Annual*; D. Hannay, *A Short History of the Royal Navy* (from 1217 to 1688).

Navy League, a British propagandist society established in 1895 for the purpose of keeping up public interest in the Royal Navy, and for the support of the ideals of British naval supremacy. The head-quarters are at Victoria Street, London, S.W.

Nawanagar, a native state of Kathiawar, India, in the Gujarat division of Bombay Presidency, with a seaboard on the Gulf and Little Rann of Cutch. The throne of Nawanagar was ascended in March, 1907, by Ranjitsinjhi (q.v.), better known to Britishers as one of the greatest batsmen who ever lived. Cereals are grown. A railway connects Rajkot with Nawanagar, the principal town and seaport on the Gulf of Cutch. It was founded by Jam Rawal in 1540. There is a pearl-fishery, and among other industries is that of cloth-making. The town water-supply is drawn from a 600-acre reservoir, and is led by an aqueduct some 9 miles long. State area, 3791 sq. miles; pop. 340,000. Pop. of town about 50,000.

Naxos, the largest and most important of the Cyclades group, in the Ægean Sea; area, about 200 sq. miles. It is mountainous (culminating points 3294 and 3251 feet altitude respectively), but is also agriculturally productive and is renowned for the quality of its oils, fruits, wines, cereals, and cotton. Marble is also worked, and it is recorded that the sculptors of Naxos formed an important school of early Greek art. Remains of colossal but unfinished statues are still extant in several of the quarries. Emery is an important mineral product. Naxos, a seaport on the north-west coast, is the capital.

Naxos was a member of the Delian League, but was annexed by Athens after a revolt in 417 B.C., and remained under Grecian domination until the disruption of the empire. An old castle located in the town of Naxos is a relic of the daring capture of the island in A.D. 1207, and the foundation of a duchy by a Venetian, Marco Sanudo. The duchy was independent until its extirpation by the Turks, who took Naxos in 1566. The island has formed a part of the kingdom of Greece since the War of Independence.

Nayarit, a maritime state of Mexico, on the Pacific, lying around the line of 22° N. lat. It is encircled by the Sierra de Nayarita, except where a break is made by the valleys of the Rio Grande de Santiago and its affluent the Guazamota, and others, which traverse the state. Wheat, tobacco, sugar, and coffee are produced; gold, silver, and lead are worked. Tepic is the capital. Area, 10,953 sq. miles; pop. (estimated), 175,000.

Nazarenes, or **Nazaræans**, a designation given to the early Christians from the town of Nazareth, where Christ dwelt (*Matt.* ii, 23; *Acts*, xxiv, 5). The name was also applied to a sect which arose at the end of the first century, and existed chiefly in Egypt. They are supposed to have retained a judaizing adherence to the Mosaic law, and to have held heretical views about the divinity of Christ.

Nazareth, an ancient town of Galilee, the early home of Christ, now called En-Nâsira. It is not mentioned in the Old Testament, and was an obscure place, a mere village, in the time of Christ (*John*, i, 46). Oriental Christians call themselves Nasâra, hence the name of the place is preserved in En-Nâsira. The modern town stands on the slopes of the Jebel-es-Sikh. There is a Latin monastery, a church (1730), and the house or workshop of Joseph located in an enclosed court. During the European War Nazareth was captured by British troops on 20th Sept., 1918. Pop. 11,000.

Naz′arites, or **Nazirites**, among the ancient Jews, persons who devoted themselves to the peculiar service of Jehovah for a certain time or for life. The law of the Nazarites (from the Heb. *nazar*, to separate) is contained in *Num.* vi, 1–21.

Neagh, Lough (lo*h* nā or nā′ȧ*h*), a lake of Ulster, Ireland, the largest in the British Isles, being 19 miles long by 12 miles broad, and covering an area of 153 sq. miles. It washes the counties of Antrim, Armagh, Tyrone, and

Londonderry. Its greatest depth is 102 feet, and it is 48 feet above the sea-level. The outlet of Lough Neagh is at its north extremity through Lough Beg into the Lower Bann, and it is connected by a canal system with Belfast, Newry, and Lough Erne. Its waters are well known for their petrifying properties.

Nean'der, Johann August Wilhelm, Protestant theologian, born of Jewish parents at Göttingen in 1789, died at Berlin 1850. He was early converted to Christianity, and was appointed extraordinary professor of theology at Heidelberg in 1812. In the same year, however, he accepted an invitation to the University of Berlin, where he spent the remainder of his life in uninterrupted labours for the good of the Church and general learning. His chief works are his *Life of Christ*, in refutation of Strauss; his *General History of the Church*; and his *History of the Apostolic Church.*

Neanderthal Man (ne-an'der-tal). The Palæolithic race in the Mousterian stage of culture has been called the Neanderthal, the races of the earlier stages being 'pre-Neanderthal'. The name Neanderthal was first given because fragments of a human skeleton and the upper part of a skull with distinctive characters were discovered in 1857 in a cave in Neanderthal, near Düsseldorf. Since then a large series of similar skeletal remains have been found. During the third inter-glacial epoch the Neanderthal type of man occupied Europe from Gibraltar to Düsseldorf, and from Southern England to the Carpathians. A skeleton found in 1908 in a grotto near La Chapelle-aux-Saints in France makes it possible for us to realize what sort of men the Neanderthals were. They were of short stature with clumsy and muscular bodies; the body was carried in a half-stooping slouch upon short legs bent at the knees, while the head protruded forward from a short, massive, and stiff neck. The head was very large and flattened, with poor frontal development, the brain being largest in the posterior region, believed to be concerned chiefly with the faculties of memory and observation. Probably the Neanderthal was an ideal tracker. He had heavy and protruding eyebrow ridges, very large eye-sockets, a broad nose, and a receding chin. His body may have been covered with hair. The arms were relatively short, and although the hands were large, they lacked that "delicate play between the thumb and finger characteristic of modern races". It would appear that the Neanderthals entered Europe from Africa in association with southern fauna, but they remained during the subsequent cold period when northern fauna returned to South-Western Europe. The flint implements manufactured and used by them are those first identified among the relics found at Le Moustier, near the Vézère, and since called Mousterian. There was a much closer kinship between the Neanderthal Mousterian industry and the industries of the pre-Neanderthal peoples of the earlier Acheulean, Chellean, and pre-Chellean epochs than between the Mousterian industry and that of the Aurignacian, which was introduced by the Cro-Magnon races which belonged to the *Homo sapiens* (modern man) group. *Homo sapiens* replaced, and perhaps displaced, *Homo neanderthalensis* of the Mousterian culture stage. Neanderthal man's Mousterian industry, the highest of its class, was the last industry of the Lower Palæolithic age, during which there were other human types now called *Eoanthropus* and *Palæanthropus.* Some ethnologists hold that the natives of Australia are direct descendants of Neanderthal man. Others contend that Neanderthal man has no modern representatives, and they argue that the Australians belong to the species *sapiens. Homo sapiens* and *Homo neanderthalensis* were descended from the same ancient stock, but became specialized along their distinctive lines. Early ancestors of both stocks retained certain features in common, and among modern men the Australians still retain some in a modified degree. Rhodesian man was of Neanderthal type.

Neath, a town and river-port of Glamorganshire, South Wales, on the Neath; served by the Great Western, Neath & Brecon, and local railways, and by canal. Copper-smelting, tinplates, steel, and chemical manufactures are among the industries. In the heart of a vast coal-mining region, Neath has a profitable transit trade in coal. Near the town are the remains of Neath Castle and Abbey, both founded about 1130–1, when Neath also came under the domain of the Lords of Glamorgan. Pop. (1921), 18,936.

Nebo, or **Nabu,** an ancient Assyrian and Babylonian deity, lord of the planet Mercury, and ruler of the hosts of heaven and earth, according to Babylonian inscriptions, especially honoured in Borsippa. Statues of Nebo have been found in Nineveh.

Nebras'ka, a west-north-central state of the United States. From an altitude of 5000 feet in the west it slopes eastward to the valley of the Missouri (1000 feet altitude), which forms the Nebraska-Iowa boundary. The Platte (or Nebraska) River traverses the state; the Niobara forms part of the northern boundary; both join the Missouri. The chief towns are Omaha (pop. 1920, 191,601) and Lincoln (pop. 1920, 54,934), the state capital. Nebraska City (pop. 6500) is a small place, the county seat of Otoe county, occupying the site of Fort Kearney. The Union Pacific, Chicago & North-Western, and other railways converge on Omaha. The railway mileage for 1918 was 8332, and there was an additional 258 miles of electric track in 1919. Roman Catholicism is the predominant religious faith. Agriculture is of great importance, Nebraska being third wheat-growing state of the United States (60,480,000 bushels in 1920). Other crops are maize (255,528,000 bushels, 1920), oats (88,040,000 bushels), and sugar-beet. Live-stock raising is progressive; abattoirs and canneries are mainly located at South Omaha. Sheep-farming (wool clip, 1,730,000 lb., 1919), mining, and quarrying are important; the potash industry is the largest in the United States; printing and publishing, soap and candles, and brick and tile manufactures are extensive. The Missouri is navigated by vessels plying between Omaha and Sioux City (Iowa). The Federal irrigation district of western Nebraska embraces 300,000 acres. 66,844 acres of land unappropriated and unreserved (1922) are available for settlement. Education is compulsory between the ages of seven and fifteen years, and there are four State normal schools. The State University at Lincoln (founded 1871) and the Creighton University (R.C.) at Omaha are important. The Wesleyans and the Disciples have also universitics. There is an Indian Reserve of 6118 acres; pop. (1920), 2448. State area, 76,808 sq. miles (of which 702 sq. miles are water); pop. (1920), 1,295,502.

Nebraska was sold to the United States by Napoleon in 1803 (Louisiana purchase). It became a territory in May, 1854, and was made a state on 1st March, 1867. There are 93 counties in the state. The present Government comprises a Governor, and a Legislature composed of a Senate (33 members), and a House of Representation (100 members). Legislators are elected for two years. Two Senators and six Representatives are sent to Congress.—Cf. A. E. Sheldon, *History cf Nebraska.*

Nebuchadnezzar (in *Jeremiah* and *Ezekiel, Nebuchadrezzar*), a king of Babylon, celebrated as the conqueror of Judah. He reigned from 604 to 561 B.C. according to the opinion of modern chronologists, or from 606 to 563 B.C. according to that of older chronologists. He was the son of Nabopolassar, by whom the Kingdom of Babylon was definitely made independent of the Assyrian monarchy. In the fourth year of Jehoiakim, King of Judah (605–4 B.C.), he defeated Pharaoh-Necho, King of Egypt, at Carchemish (Circesium), on the Euphrates, and subjugated Syria and Palestine, carrying off with him the sacred vessels of the temple and the chief Jews into captivity. He destroyed Tyre in 585, and some years later he invaded and ravaged Egypt. During the peaceful years of his reign he rebuilt in a magnificent manner Babylon and many of the other cities of the empire, and constructed vast temples, aqueducts, and palaces—revealed by recent excavations (1899–1911). His insanity and the events preceding are only known to us from the *Book of Daniel.*

Neb′ula (pl. **nebulæ**), in astronomy, the name given from their cloud-like appearance to a class of celestial objects mostly visible only in telescopes. One or two of the largest can be faintly discerned by the naked eye under the most favourable circumstances. Many objects formerly reckoned as nebulæ have been resolved into stars under the application of more powerful telescopes, but the spectroscope shows that many others are not stellar. Nebulæ may be divided into two main groups: (1) the green nebulæ, which give a spectrum of bright lines, and must be composed of glowing gas; (2) the white nebulæ, which give a continuous spectrum, upon which in some cases dark lines can be discerned. The white nebulæ must contain incandescent solid or liquid matter, or else gas at high pressure. They may consist of stars. In practically all cases they appear to have a spiral form, the typical structure being that of a central nuclear mass, from which diverge at opposite sides two spiral arms. The thickness of the spiral is small compared with its areal extension. Spiral nebulæ present to us different appearances according to their inclination to our line of sight. Thus one may look approximately circular, another elliptical, while other nebulæ of practically straight-line appearance, with a thickened part in the middle, are doubtless spirals viewed edgewise. In their distribution on the celestial sphere the white nebulæ avoid the Milky Way. The largest is the Great Nebula in Andromeda. The green or gaseous nebulæ appear mostly in or near the Milky Way. They include the subclasses of Irregular and Planetary Nebulæ. Of the former kind is the Great Nebula in Orion. Planetary nebulæ present a roughly circular form, and are named from their resemblance to planetary discs as shown by the telescope. The green nebulæ contain hydrogen and helium, but the brightest line in their spectrum is unknown terrestrially, and the element producing it has been designated *nebulium.* Some astronomers think that the spiral nebulæ may be external galaxies of stars, or island universes comparable with our own and at enormous distances from it, but others consider that they are subordinate parts of our universe, being star clusters too closely packed for telescopic resolution.

Nebular Hypothesis, a theory proposed by Laplace to account for the features of the solar system. It postulated the former existence of a vastly extended nebula, containing the materials now forming the sun, planets, comets, &c. The nebula was supposed to have a motion of rotation. Owing to loss of heat by radiation it contracted, the rotation increasing, until a ring of matter was detached at its periphery. With further contraction successive rings separated. Each ring subsequently consolidated itself to form a planet, revolving round the final residual central mass, which is our present sun. Satellites were similarly formed to revolve round some of the planets. There are several formidable, and in fact insuperable, dynamical objections to the theory. Some of these relate to the formation of rings, their aggregation, the orbital inclinations, certain retrograde motions, and the sun's slow rotation. While development from some kind of nebular beginning is generally believed in, it is recognized that the hypothesis must be greatly modified. Chamberlin and Moulton have propounded the *Planetesimal Hypothesis.* It is suggested that another stellar body made a comparatively close approach to the 'pre-sun'. Owing to the tidal strains produced the sun was disrupted, and matter was ejected in two arms which extended outwards in convoluted form, the configuration resembling a spiral nebula. In the scattered matter (planetesimals) there were certain larger and denser masses, which acted as centres of aggregation for the finer surrounding material, and thus formed planets. It is claimed that the theory accounts satisfactorily for many of the characteristics of the system, while avoiding the difficulties involved in the Laplacian hypothesis.

Necho, or **Neku,** a king of Egypt, mentioned in *2 Kings*, xxiii, 29 and *Jer.* xlvi, 2. He belonged to the twenty-sixth dynasty; succeeded his father, Psammeticus I, and reigned from 610 to 594 B.C. He extended his dominions from the south of Syria to the Euphrates; defeated Josiah, King of Judah, at Megiddo, but was ultimately driven back by Nebuchadnezzar.

Neckar, a river of Germany which rises in Württemberg, in the Black Forest, and flows through Baden into the Rhine at Mannheim, after a course of about 240 miles. Its tributaries include the Fils, Rems, Kocher, and Jagst on the right, and the Ens on the left. On its banks are Heidelberg, Mannheim, Heilbrönn, and Tübingen. It is navigable as far as Canstatt.

Necker, Jacques, French Minister of Finance, born at Geneva 1732, died 1804. In 1776 he received an appointment to the Treasury, the direction of which he retained for five years. His suppression of abuses created him many enemies at court, and shortly after the publication of his famous *Compte Rendu* he resigned and retired to Switzerland, where he published his *Administration of the Finances*, which had an immense circulation. He was recalled as Comptroller-General in 1788, and supported the convocation of the States-General, but was again dismissed in 1789. No sooner was his removal known than all Paris was in a ferment. The storming of the Bastille followed (14th July), and the king found himself compelled to recall the banished minister. He resigned in Sept., 1790, and passed the rest of his life in Switzerland.—Cf. Mme de Staël, *La Vie privée de M. Necker.*

Nec'romancy (Gr. *nekromantia*, from *nekros*, corpse, *manteia*, divination), the divination of the future by questioning the dead. This superstition originated in the East, and is of the highest antiquity. We find mention made of necromancy in the Scriptures, where it is strongly condemned. In the *Odyssey* Homer has made Odysseus raise the shade of Tiresias from the infernal regions. In many parts of Greece there were oracles of the dead, the origin of which is lost in the obscurity of history. Although this practice has been condemned by the Christian Church from the very first, it has not yet entirely ceased. The term is often extended so as to include the general art of magic.

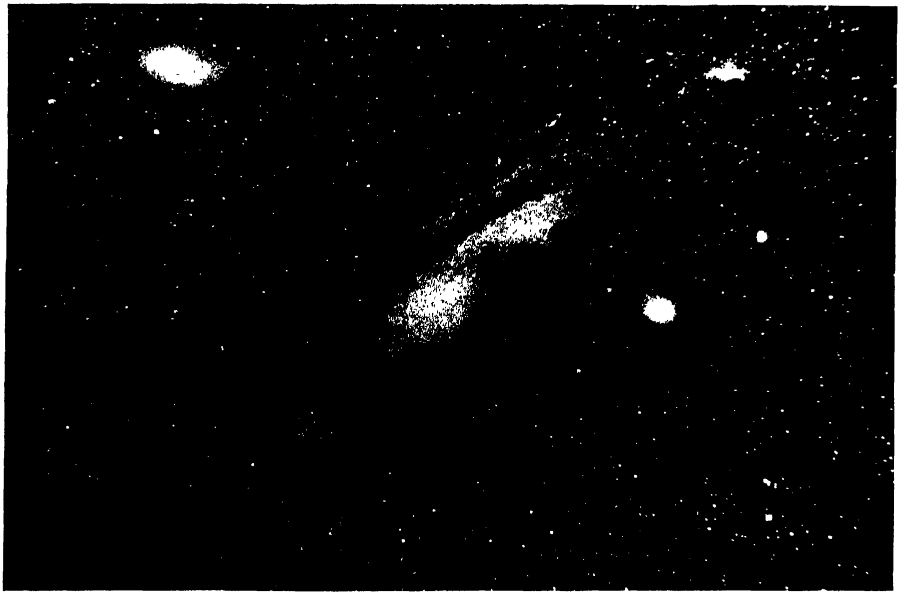
Necrop'olis (literally 'city of the dead'), a name originally applied to a suburb of Alexandria devoted to the reception of the dead, and hence extended to the cemeteries of the ancients generally. The name has also been given to some modern cemeteries in or near towns.

Necro'sis (literally 'mortification'), a medical term signifying the death of the bone substance. It is a condition of the bone substance corresponding to what gangrene is in the soft parts, thus distinguished from *caries*, which corresponds to ulceration in the soft parts. Necrosis is usually a result of inflammation of the bone, and is often attributed to cold, but frequently it is due to constitutional disease.

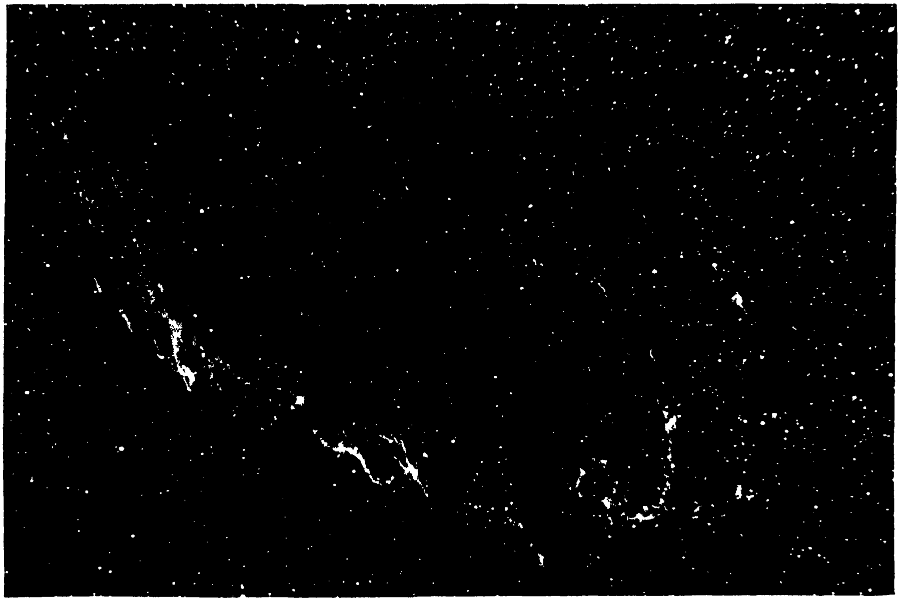
Nectar, in Greek mythology, the drink of the gods, which was imagined to contribute much towards their eternal existence. It was said to impart a bloom, a beauty, and a vigour which surpassed all conception, and together with ambrosia (their solid food) repaired all the decays or accidental injuries of the divine constitution.

Nec'tary, in botany, a gland secreting a sugary solution (nectar), or a spur or other structure serving for the reception of nectar. Most insect-pollinated flowers possess one or more nectaries, the secretion providing the principal attraction for insect-visitors. Any part of the flower may bear nectaries, e.g. the petals in buttercup or columbine, stamens in Cruciferæ, carpels in marsh marigold. Extra-floral nectaries occur on many leaves (e.g. broad bean), and are said to act as decoys, diverting ants and other 'unbidden guests' from the flowers.

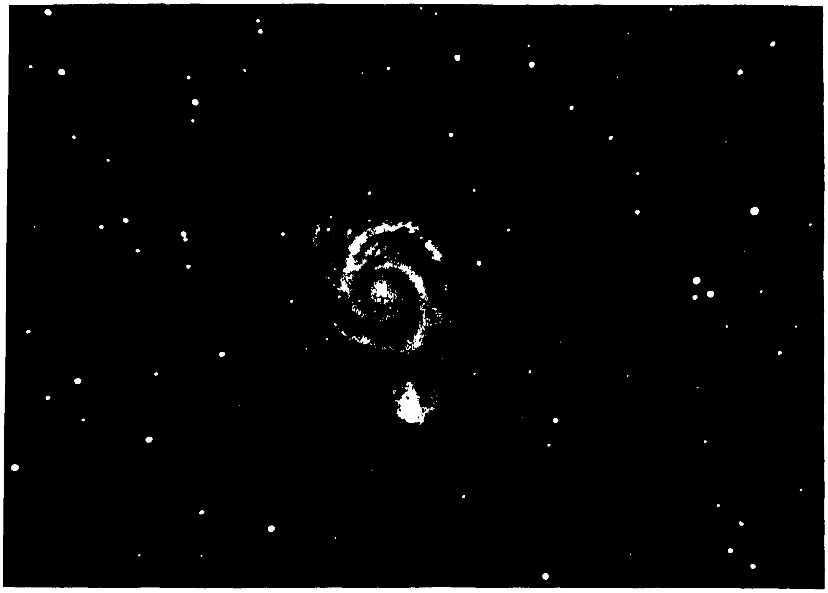
Nectocalyx, in some compound jelly-fishes (Siphonophora), the name applied to polypes in the form of swimming bells, which propel the colony by their alternate contraction and expansion.



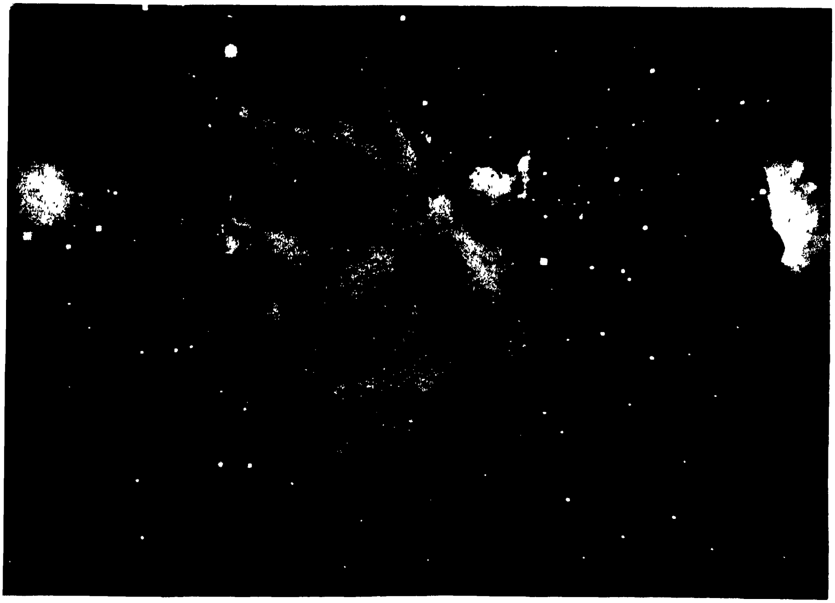
Great Nebula in Andromeda
(Scale 1 mm. = 43 seconds)



Nebula in Cygnus, N.G.C. 6992
(Scale 1 mm. = 30·9 seconds)



Spiral Nebula, Messier 51, Canum Venaticorum
(Scale 1 mm. = 16·5 seconds)



Great Nebula in Orion
(Scale 1 mm. = 35 seconds)

Nectria, a genus of ascomycetous Fungi, group Pyrenomycetes. *N. ditissima* causes a dangerous canker on ash, apple, &c.; *N. cinnabarina*, the coral-spot, is very common on dead branches, especially those of red currant, and may also behave as a parasite.

Necturus, a genus of large Salamanders found in the United States of America. They have four well-developed feet, external gills, and broad tails. There are two species, a northern one with a brown body, spotted with black (*N. maculosis*), and one found in the rice-fields of the Southern States (*N. punctatis*), which is without spots. In winter these Salamanders protect themselves from frost by burrowing deep in the mud.

Needle, a small instrument of steel, pointed at one end, and having an eye or hole in it through which is passed a thread, used for sewing. From very ancient times needles of bone, ivory, wood, and bronze have been used. The manufacture of steel needles was first introduced into England in the reign of Elizabeth. The manufacturing operations that an ordinary sewing-needle goes through are very numerous, and many of the processes are performed by automatic machinery with great saving of time and labour. Redditch, in Worcestershire, is the chief seat of needle manufacture in Britain, and the best foreign needles are made at Aix-la-Chapelle. An ordinary sewing-needle is made of Sheffield crucible steel drawn to wire of suitable diameter. When cut into lengths, each sufficient to make two needles, the wires are straightened by rolling them in bundles under a heavy iron tool. At one time the points were made by holding the wires to a grinder by hand, but now the wires are fed on to a revolving wheel, to the rim of which they are fixed by rubber bands, and each in turn is brought against a grindstone. The operation is repeated for the other end. The grooves at the ends are then pressed, the eyes pierced, and the needles separated. They are then hardened and tempered by a suitable heat treatment and oil quenching. Finally the needles are scoured, and the eyes smoothed and polished. Modifications of the ordinary sewing-needle, such as those used in the various forms of sewing-machines, in sail-making, bookbinding, glove-making, and darning are manufactured in the same way.

Needle-ore (aikinite, or ‘ acicular bismuth ’), native sulphide of bismuth, lead, and copper, occurring in the Urals, embedded in quartz in long, thin, steel-grey orthorhombic prisms. It consists of lead 35·8, copper 11, bismuth 36·7, and sulphur 16·5, and usually accompanies native gold.

Negapatam′, the port of Madras, India. It was an early settlement of the Portuguese, fell to the Dutch (1660), and has been British since 1781. It is an emigrant port for Rangoon and the Federated Malay States. Pop. 60,200.

Negligence, in law, the omission to do that which ought to be done. When such want of care results in injury to another, or involves a wrong done to society, it renders the party guilty of negligence liable to either an action for damages or trial for misdemeanour. In law there are recognized three degrees of negligence: *ordinary*, the want of ordinary care or diligence; *slight*, the want of great care or diligence; and *gross*, the want of slight care or diligence. The person charged with negligence must have been under an obligation to exercise care or diligence either assumed by contract or imposed by law. An alleged act of negligence must always be the proximate cause of the injury sustained; but any injury caused to a person by another who at the time is exercising due care in the commission of a lawful act is not actionable. An error of judgment is not negligence. The question of negligence is usually one for a jury, and the onus of proof rests on the plaintiff, except when the thing resulting from the negligence speaks for itself. A master is responsible for the negligence of his servants in the course of their employment, but in no case can redress be had where contributory negligence on the part of the plaintiff is proved.

Negrillos, a pygmy race of tropical Africa, such as the Akoni of the Gabun, the Obongo of the Ogowi, Doko of Abyssinia, Akka, Bambutte, Manbettu of the Congo, and the Vazimba of Madagascar. The Akka have their hair evenly distributed, like the Dravidians of India. They have average heads, and are Mesaticephalic. Their height varies between 4 feet 1 inch and 4 feet 10 inches.

Negri-Sembilan (literally ‘ nine states ’), one of the Federated Malay States, comprising a confederation of the small native states of Sungai-Ujong, Johol, Jelebu, Rembau, and five smaller states. The supreme authority is vested in the State Council, which is composed of the Sultan, the British Resident and his secretary, and some selected Malay chiefs and Chinese merchants. The Resident is responsible to the Governor of the Straits Settlements, who is, incidentally, the High Commissioner. Negri-Sembilan is traversed by mountain spurs (Mount Ophir, 3840 feet) which are densely afforested in the highest regions. The State railways bifurcate at Gemas, Negri-Sembilan, to form east and west coast routes, joining the Siamese railways on the Perlis-Siam and Kelantan-Siam boundaries respectively. Area, 2550 sq. miles; pop. about 140,000.

Negri′tos, the name given to several small black peoples inhabiting the islands, &c., of South-Eastern Asia, and often confounded with the Papuan race. The chief tribes are the Aëtas, the indigenous people of the Philippine Archipelago, still inhabiting the interior of the Islands of Luzon, Negros, Panay, Mindoro, and Mindanao; the Semangs of Malacca; and the Mincopies inhabiting the Andaman Archipelago. They are dwarfish in stature, averaging from 4 feet 6 inches to 4 feet 8 inches in height; the nose small, flattened or turned up at the apex, and the hair soft and frizzled. The aborigines of Tasmania, now extinct, were of this race. The fusion of the original woolly-haired Negrito with the straight-haired Malay has given rise to the frizzly-haired Melanesian.

Negroes, a race of mankind probably indigenous to equatorial Africa, but now ranging from the southern margin of the Sahara as far as the territory of the Hottentots and Bushmen, and from the Atlantic to the Indian Ocean. These tribes are all dark-coloured, yellow, copper-red, olive, or dark brown, passing into ebony-black. The typical negro, however, is described as having a black skin, woolly or crisp hair, a protuberant mouth with thick lips, nose thick and flat, long narrow skull, hair of the face scanty, thorax compressed, long arms, calves poorly developed, and feet comparatively flat with long heels. The brain, though essentially similar to that of the white races, is not so large, averaging about 5 ounces less than that of the white man. The negro as a rule differs as much from the whites in mental as in physical characteristics, though there are many individual exceptions. He is very receptive, and in that which requires imitation he is well developed, but in that which requires independent thought he stands on a low stage. He has less nervous sensibility than the white man, and can flourish in climates fatal to the higher races, and the race does not diminish in contact with civilization. Certain negro tribes of Africa present a surprising picture of barbaric civilization from contact with Mahommedanism. The slave system has alienated great numbers of negroes from their native country mostly to America and the West India Islands, where there has been considerable intermixture of races. There are nearly 10,000,000 negroes in the United States. —Bibliography: J. A. Tillinghast, *The Negro in Africa and America*; B. G. Brawley, *A Short History of the American Negro*; J. Deniker, *Races of Man*.

Negro Rio, a river of Latin America, the largest left-bank affluent of the Amazon (q.v.). Its principal tributaries are the Uaupés, Padauiry, Rio Branco, and Parima. Length, about 1500 miles, practically navigable throughout.

Negros. See *Philippines*.

Nehemi'ah, a Jewish governor, who was born in captivity, but was made the cup-bearer of Artaxerxes Longimanus, King of Persia. He was sent, 444 B.C., as governor to Jerusalem, with a commission to rebuild the walls and gates of this city. He accomplished his purpose, but not without difficulties, arising partly from the poverty of the lower classes of the people, and partly from the opposition of the Ammonites and other foreign settlers. The *Book of Nehemiah* contains Nehemiah's account of his proceedings, with other matter which forms a supplement to the narration contained in the *Book of Ezra*.

Neisse (nī'sė), a town and railway junction in Upper Silesia, on a river of the same name. The church of St. James was completed in 1430. Neisse was formerly administered by the Bishop of Breslau, and was capital of the principality of Neisse. Pop. 26,000.

Nejd and Hasa, an emirate of Central Arabia which represents the quondam Wahabite Empire (founded 1745). The people are Arabs, and the great part of the surface is sandy desert interspersed with fertile valleys and oases. The emirate includes El Hasa, on the Persian Gulf, from which Abd-al-Aziz es-Saud expelled the Turks in 1913. Al Riyadh is the capital. Pop. 250,000. The emirate of Jebel Shammar lies to the north of Nejd, and was formerly within its jurisdiction. Hail is the capital. The prevailing people are Bedouin in character. Pop. about 200,000. See *Arabia*.

Nellor, a town of India, in the Presidency of Madras, capital of district of the same name. It is on the Madras-Calcutta main line, and communicates with Madras by the Buckingham Canal. Pop. 33,240.—The district lies on the Coromandel coast; area, 8739 sq. miles. It is famous for its breed of cattle. Pop. 1,500,000.

Nelson, Horatio, Viscount, a younger son of a Norfolk clergyman, was born at his father's rectory of Burnham-Thorpe on 29th Sept., 1758. Through his mother he was a great-grand-nephew of Sir Robert Walpole, and a nephew of Maurice Suckling, a naval officer who became Comptroller of the Navy. Under his uncle's influence he entered the navy in 1770 at the age of twelve, and in 1773 he took part in an expedition to the North Pole. Suckling was a scientific sailor, and he impressed on the boy the necessity of acquiring an expert knowledge of his profession, and was able to help him to promotion. His first active service was in the War of American Independence, and he attracted the attention of Admiral Lord Hood, who regarded him, in spite of his youth, as an authority on naval tactics. Like Wellington, he found his opportunity in the great French war which broke out in 1793. During the first years of the war he was employed in the Mediterranean, and he lost the sight of his right eye in the reduction of Corsica. He acquired his first reputation in the battle of Cape St. Vincent

(14th Feb., 1797), when his daring and ability contributed much to the completeness of the victory won by Sir John Jervis (Lord St. Vincent) and were recognized by his creation as a Knight of the Bath. In the following July, in an independent operation against Teneriffe, he received a wound which necessitated the amputation of his right arm. In 1798 he was sent in pursuit of Napoleon's expedition to Egypt, and on 1st Aug. he won the battle of Aboukir or the Nile. He adopted the daring device of sending part of his fleet between the French ships and the shore, and so attacked them on two sides, and his exploit constitutes the most daring and the most complete naval victory of modern times. Out of thirteen ships of the line and four frigates, with which the French began the fight, they had, at the end of the day, only two ships and two frigates. He was made Lord Nelson of the Nile by George III, and Duke of Brontë by the King of Naples, whose dominions had been endangered by Napoleon's Mediterranean expedition.

Nelson was entrusted with the protection of Naples, and this appointment had a disastrous influence upon his private life. He had married in 1787, apparently happily, but at Naples he fell in love with the famous Emma, Lady Hamilton, the wife of the British Minister, with whom he contracted a permanent liaison. In December the French took Naples from the land, and Nelson accompanied the Neapolitan court to Palermo, and organized the blockade of Naples, which was recovered in June, 1799. As commander-in-chief of the Neapolitan navy he dealt severely with deserters to the French, and his conduct has been attributed to the personal influence of Lady Hamilton. The censure is unjust, but it is not so easy to defend a subsequent refusal to obey the order of his commander-in-chief and to leave Naples; he was, however, suffering from the effects of a head-wound received at the Nile. His health was bad, he imagined that his career was over, and he returned to England in company with the Hamiltons. A separation from his wife immediately followed, and he made her a liberal allowance. In 1801 Nelson was sent, under the command of Sir Hyde Parker, to break up the Northern Confederation, which had proclaimed an armed neutrality against Great Britain as a protest against the British methods of blockade. He wished to deal a decisive blow by leaving a portion of the expedition to watch the Danish fleet and proceeding into the Baltic to destroy the Russian fleet, but Parker regarded the project as rash, and it was decided to attack Copenhagen. Parker accepted Nelson's scheme of attack, and entrusted the most important part to him. In the course of the battle (1st April, 1801) Nelson received a signal, "Discontinue the action", and, putting a telescope to his blind eye, remarked, "I do not see the signal"; but he was aware that it was intended only to relieve him of the responsibility if he should deem a withdrawal desirable. Ultimately he suggested a truce to put an end to the slaughter; an armistice was arranged, and the murder of the Emperor Paul, which had taken place a week before the battle, broke up the Northern Confederation.

When the French war was renewed, on the rupture of the Treaty of Amiens in 1803, Nelson was given the command of the fleet in the Mediterranean, and for nearly two years he watched for an opportunity of destroying the French fleet and rendering impossible Napoleon's projected invasion. In 1805 Napoleon devised a scheme for obtaining a temporary command of the Channel without risking a battle. The French and Spanish fleets were to escape from the harbours in which they were being watched by the British, and, while the British fleet was dispersed in search of them, they were to return and convoy a French army to England. Part of the scheme was successfully accomplished, but in the end Nelson found the enemy near Cadiz and fought the battle of Trafalgar. He had only twenty-six ships against thirty-three of the enemy, but he succeeded in bringing a superior force against the particular portion of the enemy's fleet which he selected for attack at successive stages of the battle. At the proper time he himself attacked the enemy's centre and pierced their line, but was mortally wounded on the quarter-deck of his flagship, the *Victory*. Before he died he heard of the surrender of fourteen ships—the final number was twenty-two—and his last words were "Thank God, I have done my duty", a reference to the famous signal which he had hoisted at the crisis of the battle, "England expects that every man will do his duty" (21st Oct., 1805). He had aimed at the annihilation of the enemy's fleet, and his object was practically accomplished, for he had secured his country from the danger of invasion. Nelson was buried in St. Paul's on 9th Jan., 1806, and in 1829 Trafalgar Square was planned as a permanent memorial; the column and statue were completed in 1849, and the bronze lions were added in 1867.—BIBLIOGRAPHY: R. Southey, *Life of Nelson*; Captain A. T. Mahan, *Life of Nelson*; J. C. Jeaffreson, *Lady Hamilton and Lord Nelson*.

Nelson, a seaport and chief town of the district of Nelson, New Zealand, on Tasman Bay, South Island; served by railway south-west to Glenhope, with projected extensions to Christchurch. It was settled by the New Zealand Company in 1841, and has a large coasting trade. Pop. (1920), 10,340.

Nelson, a municipal borough in North-East Lancashire, England, on the Lancashire & Yorkshire Railway. There are cotton-factories, confectionery-works, and engineering establishments. The town is connected with Burnley (3 miles) and Colne by tram. Nelson is a modern town, and became a borough in 1890. Pop. (1921), 39,839.

Nelson River, a river of Canada, which issues from Lake Winnipeg, and after a tortuous course of about 350 miles falls into Hudson Bay at Port Nelson. The Saskatchewan, which enters Lake Winnipeg, is frequently taken as the Nelson River, and the united length is then about 1700 miles.

Nelum'bium, a genus of aquatic plants inhabiting the fresh waters of the temperate parts of the world, type of the nat. ord. Nelumbiaceæ, having large polypetalous flowers with numerous stamens. The best-known species is *Nelumbium speciōsum*, the Hindu and Chinese lotus, a magnificent water-plant of the rivers and ditches of all the warmer parts of Asia, the Malay Archipelago, Australia, and also found in the Nile (formerly at least). The numerous canals of China are filled with it, its tubers being there used as a culinary vegetable. It is a most beautiful plant, with peltate leaves and handsome rose-coloured flowers on tall stalks, and is frequently cultivated in hothouses. In Asia it is generally deemed sacred, and figures in religious rites. *N. luteum*, the yellow water-bean of the southern United States, has starchy rhizomes, with tubers like those of the sweet-potato, which are used for food.

Nelumbium speciōsum

Nematel'mia, or **Nemathelminthes**, the invertebrate phylum including those parasitic worms which possess bodies of rounded or cylindrical shape, together with a smaller number of non-parasitic forms. Among the most familiar are the Gordiacĕa, or 'Hair-worms'. These possess slender hair-like bodies, and are found as parasites in the interior of beetles and other insects, during the first stages in their development. On arriving at sexual maturity they escape from the bodies of their hosts and seek the water of pools, in which the eggs are deposited in the form of lengthened chains. The embryos produced from these ova are provided with a retractile proboscis and hooks, by means of which they penetrate the bodies of insects, and there develop into the sexually mature worms. Superstition formerly credited horse-hairs, introduced into water, with the remarkable property of becoming transformed into these living creatures. Another order of the Nematelmia is that of the Nematōda, which includes the following notable forms: round-worm (*Ascaris lumbricoides*), human intestines; horse-worm (*A. megalocephala*), intestines of horse; seat-worm (*Oxyuris vermicularis*), human large intestine; hook-worm (*Dochmius duodenalis*), a dangerous parasite that burrows in the walls of the small intestine of man; gape-worm (*Syngamus trachealis*), of poultry and game-birds; *Trichina spiralis*, a minute species, of which enormous numbers may be found encysted in the muscles of rat, pig, and man; the guinea-worm (*Filaria medinensis*), and its minute ally (*F. sanguinis hominis*) that is a blood parasite in man. Some plant diseases are caused by nematodes, e.g. clover-sickness (*Tylenchus devastatrix*), ear cockle (*T. tritici*) of wheat, and beet-sickness (*Heterodera Schachtii*).

Nemat'ocyst, in zoology, a 'thread-cell' of the Cœlenterata, that is, a cell or minute sac, in the interior of which is a long filament, often serrated or provided with spines, and capable of being swiftly protruded. It is to their nematocysts that the power of stinging possessed by many of the jelly-fishes, &c., is due.

Nematoda. See *Nematelmia*.

Neme'an Games, ancient Greek games, held in the valley of Nemea in Argolis, where Hercules is said to have killed the Nemean lion. They recurred ordinarily every second year, and were similar in character to the other Greek games.

Nemer'tinea, represented by the marine 'ribbon-worms'. They possess flat, ribbon-like bodies, which, as in the Borlasia of the British coasts, may attain a length of more than 15 feet. Some of the species of the type-genus Nemertes attain a length, in their extended state, of 30 or 40 feet, which they can suddenly contract to 3 or 4 feet. There is a curious proboscis, contained in a sheath when at rest, and capable of being protruded from the front end of the body.

Nemesia, a genus of South African herbs, ord. Scrophulariaceæ. *N. strumosa* is a valuable garden annual, the race introduced by Messrs. Sutton showing an extraordinary range of beautiful colours.

Nem'esis, the personification of the righteous anger of the gods, inflexibly severe to the proud and insolent, i.e. retributive justice. In Homer she does not appear as a person, but the word *nemesis* is used as a noun in the sense of righteous anger. In the *Theogony* of Hesiod she is the daughter of Night, the avenging Fate who checks and punishes the favourites of Fortune.

Nemours, a town of France, in the department of Seine-et-Marne, on the Loing; served by the Paris-Lyon-Mediterranean Railway. There is a feudal castle, and an old church. In the vicinity there are important quarries of Fontainebleau sand. Many Gallo-Roman remains prove the antiquity of Nemours, which is presumed to have taken its name from the woods (*Nemora*) by which it was once surrounded. In the twelfth century the lordship of Nemours (in Gâtinais) belonged to the House of Villebeon, but was sold to King Philip III (1274–6), and became a county in 1364. Charles VI of France erected it into a duchy in 1404, and presented it to Charles III of Evreux, King of Navarre. The Duchy of Nemours was in the possession of the Orleans family at the time of the Revolution. Pop. 5000.

Nennius, the supposed author of a collection of chronicles and genealogies styled *Historia Britonum*, written in Latin, and reaching down to A.D. 655. The author is supposed to have been a monk at Bangor in Wales. The authorship and authenticity of Nennius have been much disputed.

Neoco'mian, in geology, a term applied to the lowest stage of the Lower Cretaceous series, represented in England by the Hastings Sand and Weald Clay.

Ne'ogene, in geology, a name given by some geologists to the Pliocene and Miocene systems, to distinguish them from the older Oligocene and Eocene strata.

Neolith'ic. This term was originally applied to the polished and other implements of the latter part of the Stone Age, so as to distinguish them from the earlier implements called Palæolithic. 'Neolithic Age' or 'Neolithic phase of culture' are, however, terms that must be applied with caution, especially outside Western Europe. During the Neolithic Age, which has not everywhere, even in different areas of Europe, the same chronological significance, stone implements were polished, domesticated animals became common, cereals and fruit-trees were cultivated, pottery made, linen woven, boats were in use, and definite religious beliefs were entertained. At the same time some stone-polishing peoples had only the dog as a domesticated animal and did not practise agriculture. Louis Siret has found evidence in Spain which points to the intrusion there of Easterners who extracted ores and carried them away to the foundries of their own country, or those of the peoples who purchased ores. They introduced into Spain the fine flint-working called Neolithic, which Siret considers to be of Egyptian origin. Different kinds of flint were used, but no local beds of these can be traced. This new industry spread over the northern maritime area. Associated with these flints have been found religious objects shaped from ostrich eggs from Africa, and Egyptian ivory, alabaster vases, figurines of the mother-goddess of Mesopotamia, amber from the Baltic, and jet from Whitby in Yorkshire. Of special interest are the green-stone axes, for one of these has been found associated with a 'prehistoric canoe' discovered in Clyde silt, at Glasgow, about 25 feet above the present sea-level. One Glasgow canoe had a cork plug, and the cork must have come from Spain or Italy where cork trees grow. Neolithic polished stone axes are so finely balanced that they revolve on a centre of gravity. The mathematical skill required for their construction cannot be regarded as 'primitive'. Evidently the Neolithic industry was introduced by a people in a comparatively high stage of civilization. The barley-seeds used were those of cultivated barley which grows wild in Egypt. Siret's view is that the Easterners who introduced the Neolithic industry into Spain visited all the maritime west and north. That Egypt was in touch with the colonies of Easterners in Spain is suggested not only by the ivory, &c., but also by a diadem of gold found in a necropolis in Southern Spain which belongs to the age of polished stone. These colonies of Easterners in Spain were broken up by a bronze-using people from Central Europe. Siret refers to them as Phœnicians, and suggests that the native Iberians, among whom the imported Neolithic industry spread, had no knowledge of the metals the Easterners had come to collect. It was in the interests of the strangers to keep the natives ignorant. They used flint themselves in their colonies, and the Neolithic industry reached a high state of development in consequence. Among the exports of the colonists were silver-bearing lead, tinstone, copper ore, and gold dust. See *Flint Implements*.

Neon (symbol, Ne; atomic weight, 20·2), an element occurring in minute quantity in the atmosphere. The gas was discovered by Ramsay and Travers in 1898, along with two other new elements, which they called krypton and xenon. The proportions by volume in which the minor gaseous constituents of the atmosphere occur are, in parts per million: argon, 9330; neon, 12·3; helium, 4·0; krypton, 1·0; xenon, 0·05. Chemically, they are all inert elements (see *Periodic Table*). Next to hydrogen and helium, neon is the least easily condensed of the gases. See *Isotopes*.

Ne'ophron, a genus of birds of the vulture family, one species of which (*N. percnoptĕrus*) inhabits Southern Europe, Egypt, and Asia. It is known as the Alpine or Egyptian vulture, Pharaoh's hen, &c.

Neo-Platonism, a philosophical system resting upon a religious basis which arose in the third century of our era, and flourished in the pagan world of Hellas and Rome. It was the direct result of the religious yearning which had taken possession of the Roman world, and an attempt to construct a religious philosophy or theosophy inspired by Greek thought. It was at once the swan-song of Greek philosophy and a last effort of Paganism to stop the living waters of Christianity which were pouring over the world. Neo-Platonism is idealistic and spiritualistic, with a tendency towards mysticism. Eclectic, according to the fashion of the age, it endeavours to unite Plato's idealism with the religion of the East, to blend Platonic ideas with Oriental mysticism. It arose at Alexandria, where East and West met and commingled, where the contemplative Orient, with its tendency towards the supernatural and miraculous, and Greece with her subtle investigating spirit, in other words, logical analysis and feeling, fused, and produced a new phase of thought, prevalent during the first centuries of our era. Greek philosophers, no longer interested in empirical and rational science, turned their attention to religion, and endeavoured to solve the problems of knowledge and virtue. Neo-Platonism aimed at the highest knowledge—the knowledge of the absolute, a knowledge which alone would lead to a perfect acquaintance with the universe. The aim of philosophy, taught the Neo-Platonists, should be the knowledge of the *One* which is the cause and essence of all things, the original and primitive light from which everything emanates. This knowledge can be obtained not by thought and reflection, but in a perfect manner by *intuition*, which precedes thought, and by attaining a sort of spiritual ecstasy. Neo-Platonism rests therefore upon the proposition that the *absolute*, that which is above the senses, is the foundation of the world; and that it is knowable by intuition, or ecstatic contemplation. God is the Alpha and the Omega of everything, the beginning, the middle, and the end (He was, He is, and He shall be), and the real object of man's strivings should be an absorption in God, or a communion with God. This God of the Neo-Platonists is a mystical trinity, consisting of three hypostases or substances, having for its basis unity, which is the universal principle. From the *One* emanates the *Nous*, or pure intelligence, the image of God, and which, like the Logos of Philo, is an agglomeration of ideas. From the *Nous* emanates the world-soul, and from this again emanate the individual souls, which give rise to matter. The whole spiritual world is thus to be considered as one spiritual being. God did not create the world, nor is it an evolution from Him. It is an emanation from God, like the light radiating from the sun, without diminishing the latter. The sensible world is but an image of the intelligible world; time is an image of eternity, and emanates from it. Evil is either apparent or necessary, but if it is necessary it ceases to be evil. The soul of man, Neo-Platonists taught, is restless until, freed from the world of matter, the world of sense and reason, it returns to God by way of knowledge and is absorbed in Him. Neo-Platonism is thus both theistic and pantheistic. It teaches that God is transcendent, but it conceives everything as an emanation from Him.

There were three schools of Neo-Platonism: the Alexandrinian-Roman, the Syrian, and the Athenian. To the Alexandrinian school belonged Ammonius Saccas (A.D. 175–242), the supposed founder of the system, Longinus, Plotinus, and Porphyry. The Syrian school is represented by Iamblichus (330), who strongly manifested an Anti-Christian tendency, and Proclus (411–85). As a religion Neo-Platonism could not compete with Christianity, although it influenced the theology of St. Augustine; but as a philosophy it was again studied during the Middle Ages, and especially with the rise of humanism (q.v.). It influenced the philosophical doctrines of Giordano Bruno and Jacob Boehme, and has affinities with the systems of Fichte, Schelling, and Hegel.—BIBLIOGRAPHY: C. Bigg, *Neo-Platonism*; T. Whittaker, *The Neo-Platonists*; R. M. Jones, *Studies in Mystical Religion*; Vacherot, *L'École d'Alexandrie*.

Neot'tia, a small genus of Orchidaceæ, readily distinguished by its habit, all the species being leafless brown-stemmed saprophytes, with sheathing scales in place of leaves. One species, the bird's-nest orchis (*N. nidus-avis*), is a native of Britain.

Nepâl, an independent state on the north-eastern frontier of India, among the Himâlaya. Mount Everest is within the state. Katmandu (pop. about 80,000) is the capital; the surrounding valley has a pop. of 300,000. The people are mainly Gurkhas, mixed with Bhutias, Gurungs, Magars, Murmis, Newars, Kiratis, Limbus, Lepchas, and many other distinct but lesser races. The inhabitants of Sikkim (q.v.) are also Nepâlese. Hinduism, the faith of the Gurkhas, has almost obliterated the Buddhism of the more primitive peoples. The standard of coinage is the silver mohar, equivalent to 6 annas 8 pies, Indian; copper pice are circulated, fifty being the equivalent of a silver mohar; the Indian rupee is accepted. The valleys are cultivated for rice, tobacco, millet, and oil-seeds, and a good export trade is maintained with British India in hides, skins, cattle, opium, gums, resins, dyes, jute, wheat, pulse, rice and cereals, spice, clarified butter, oil-seeds, tobacco, timber, and saltpetre. Imports to Nepál include cattle, sheep, and goats; salt, sugar, tobacco, spices, drugs and dyes, petroleum, leather; brass-, iron-, and copper-ware; and piece goods. State area, about 54,000 sq. miles; pop. estimated at about 5 to 6 million.

The Gurkhas are a Rajpút race who migrated from Udaipur (Rájputána), settled the province of Gurkha (Nepál), and, during the eighteenth century, overran the whole country. The government is a military oligarchy, and since 1867 supreme power has been vested in the Prime Minister, who is incidentally a general in the British army. Since 1856 the Tibetan Government has paid annual tribute in Rs. 10,000 to Nepál, and receives a representative of Nepál at Lhasa and at other trade-centres for the encouragement of inter-state commerce. By the Anglo-Nepálese Treaty of Segowlie (2nd Dec., 1815) a British Envoy and a small escort of sepoys live at Katmandu, but exercise no authority in Nepálese internal affairs. During the European War the Prime Minister of Nepál supplied 20 battalions of infantry, 200,000 recruits to the Indian army, and maintained a training-reserve of 20,000 men. In recognition of Nepálese support the Indian Government makes to Nepál an annual payment of 10 lakhs of rupees.—BIBLIOGRAPHY: P. Brown, *Picturesque Nepál*; I. Massieu, *Népâl et pays himâlayens*.

Neph′eline, or **Neph′elite,** a mineral silicate of aluminium and sodium, occurring in plutonic or volcanic rocks, in small masses or veins, and in short hexagonal prismatic crystals. It is usually colourless or yellow. Its massive form, as in nepheline-syenites, has a gummy aspect, and has been called *elæolite*. Nepheline occurs abundantly in certain districts in trachyte and basalt, though it is very rare in the British Isles. It is very often altered to sodium-zeolites, and thus disappears from many rocks of great geological age.

Nephrodium, a large and cosmopolitan genus of leptosporangiate Ferns, family Polypodiaceæ. The best known is *N. Filix mas*, the common male or shield fern.

Nephthys, an Egyptian deity, daughter of Seb and Nut, and sister and wife of Seth. Her proper sphere was the nether world, though she occurs in the upper world as the instructress of Horus. She is associated as one of a tetrad with Osiris, Isis, and Horus.

Ne′pomuk, Johann von, the patron saint of Bohemia, born at Pomuk, in Bohemia, about 1330, martyred 1393. In 1378 he became court-preacher to King Wenceslaus (Wenzel), but incurring the displeasure of that monarch, he was cruelly tortured and thrown from the bridge over the Moldau into the river (1393). In the course of the fifteenth, sixteenth, and seventeenth centuries many legends gathered round his name, and in 1729 Benedict XIII canonized him. The day consecrated to his memory is the 16th of May.

Neptune, the chief sea-god of the ancient Romans. When the Greek mythology was introduced into Rome, he was completely identified with the Greek Poseidōn, all the traditions relating to whom were transferred by the Romans to their own deity. In art he is usually represented as armed with a trident, and the horse and the dolphin are his symbols.

Neptune, from a Statue at Rome

Neptune, in astronomy, the most distant of the known planets, its mean distance from the sun being 2,793,000,000 miles, and its least distance from the earth 2,675,000,000 miles. The eccentricity of its orbit is ·00855; its inclination to the plane of the ecliptic is 1° 47′. Its apparent diameter is about 2·5″. Its real diameter is estimated at about 34,000 miles, and it seems to have very little polar compression. Its mass is about 17 times that of the earth, and it revolves round the sun in 164·8 years. It has one satellite, whose period is 5 days 21 hours; mean distance from the planet, 222,000 miles; revolution retrograde. Neptune was discovered in 1846 in a position indicated independently by Leverrier and Adams, and deduced from a series of recondite mathematical calculations to find a body which could account for the long-observed perturbations of Urănus.

Neptunian Theory, a name given to a geological theory of Werner which referred the formation of all rocks and strata to the agency of water; opposed to the *plutonic*, *igneous*, or *Huttonian theory*.

Ne′reïds, in classical mythology, sea-nymphs, daughter of Nereus and Doris, daughter of Oceanus, and constant attendants on Poseidon or Neptune. They are represented as riding on sea-horses, sometimes with the human form entire, and sometimes with the tail of a fish. They were distinguished on the one hand from the Naiads or the nymphs of fresh water, and on the other hand from the Oceanides or nymphs of the ocean.

Ne′reïs, a genus of bristle-worms (Chætopoda) with long segmented bodies, antennæ or feelers, eyes when distinct four in number; mouth usually with horny jaws. Some of the species are found in most seas.

Nereocys′tis, a sea-weed of the nat. ord. Laminariaceæ, found on the north-western shores of America and opposite shores of Asia, remarkable for the stems, which attain the length of 45 fathoms, swelling at the top into large cysts or bags filled with liquid; these becoming entangled, form large floating islands on which sea-otters rest.

Nereus (nē′rūs), in classical mythology, a sea-god, the father of the Nereïds. He was the son of Pontus (Sea) and Gæa (Earth). In the ancient works of art, and also by the ancient poets, he is represented as an old man, with a wreath of sedge, sitting upon the waves with a sceptre in his hand.

Neri, St. Filippo de', the founder of the Congregation of the Oratory in Italy, was born in Florence in 1515, died 1595. He founded the order of 'Priests of the Oratory', which was approved by Gregory XIII in 1595. He was canonized in 1622.

Nero, Lucius Domitius Ahenobarbus (after his adoption by the Emperor Claudius called *Nero Claudius Cæsar Drusus Germanicus*), Roman emperor, the son of Gnæus Domitius Ahenobarbus and Agrippina, the daughter of Germanicus. He was born in A.D. 37 at Antium, and after the marriage of his mother (her third marriage), with her uncle, the Emperor Claudius, was adopted by that prince, and married to his daughter Octavia. When Nero was about seventeen years of age his mother poisoned her husband, Claudius, and succeeded in raising to the throne her son, over whom she expected to exercise the most absolute control. Nero became emperor in 54, and the year following disposed of the rightful heir, Britannicus, by poison. For the first few years his public conduct, under the control of Burrhus and Seneca, was unexceptionable; in private, however, he disgraced himself by the most odious vices, and his mother endeavoured to retain her influence by shamefully complying with his inclinations. In 59 Nero caused this detestable woman to be murdered, and then, fearing no rival in power, gave full scope to the darkest traits of his character. In 62 he repudiated his wife Octavia. The burning of Rome in 64 has been charged upon Nero himself, who, however, accused the Christians of the act. His debaucheries and cruelties occasioned an almost general conspiracy against him, known as that of Piso, in 65, the discovery of which led to more tortures and bloodshed. The revolt of Vindex was also suppressed. That of Galba in 68 succeeded, and Nero escaped arrest by stabbing himself, being then in the thirty-first year of his age and the fourteenth of his reign. He was a lover of arts and letters, and possessed much taste as a poet and histrionic performer. —BIBLIOGRAPHY: Tacitus, *Annales*; B. W. Henderson, *Life and Principate of the Emperor Nero*.

Nerva, the successor of Domitian, and one of the most virtuous of the Roman emperors. He was born in Umbria A.D. 32, died A.D. 98. He was twice consul, and was elected emperor on the death of Domitian in 96. He adopted Trajan, who succeeded him.

Nervii, an ancient people of Gallia Belgica, famous for the stand they made against Cæsar's advance in 57 and 54 B.C. They submitted to the Romans in 53 B.C. Their territory was coextensive with the old diocese of Cambrai.

Nervous System. This is evolved for the purpose of correlating an individual with his surroundings, and of controlling and co-ordinating the various bodily processes essential to health. The actions for example of the heart, of the lungs, and of the various organs concerned in digestion are all correlated to bodily needs by means of the nervous system. Its work, however, is not by any means limited to the governance of these functions, vital though they be. It receives external impressions and enables the individual to work as a whole and to carry out actions of attack, defence, procuring of food, and so on. And the nervous system in its central part at any rate is also the seat of the processes that govern conscious existence. Impressions (or stimuli) conveyed to the central nervous system from the surrounding world give rise to sensations of smell, taste, touch, or sight, &c., and as a result of such sensations emotions are called forth which may be pleasant or painful. Again, the muscular movements which result in walking, writing, speaking, or gesture are to be regarded as expressions of the activities of certain parts of the nervous system.

The nervous system is made up of nerve cells and fibres. The central parts, e.g. the brain, are composed largely of cells. The nerves (e.g those running to supply the muscles of the limbs) consist entirely of fibres, but every nerve fibre is an offshoot from a cell. Nerve fibres may be very long, of course. Nerve cells are very minute and nerve fibres extremely fine. They can only be discerned and investigated with powerful microscopes. The structural unit of the nervous system is therefore the cell plus its processes, and this unit is usually termed a ' neuron '. The nervous system, as can readily be understood, contains many myriads of neurons. From the point of view of function neurons may be receptive or conductive, according as they convey external impressions inwards or conduct outwards nervous impulses which give rise to bodily actions. *Nerve cells*, when studied microscopically, have many fibres springing oft from them. There is, however, a main process (or fibre), an essential conducting one, and this is known as the ' axis cylinder ' or ' axon '. Many such go to make up what we ordinarily know as a nerve. There are, in addition to the axons, other offshoots from the cell, called ' dendrons '. These in comparison with axons are short and never extend any distance from the parent nerve cell: they branch and intertwine, axons do not. The axons and dendrons bring the different nerve cells into relation with each other, and thus they bring about the co-ordinated action of the different neurons. Fibres, it must be remembered, are solely conducting agents in the nervous system: nerve cells are governing and nutritive. If a nerve fibre is separated from its nerve cell it speedily degenerates and disappears. The same happens if the cell itself dies or is severely damaged.

Looking at the nervous system from another point of view we may say it is divided into two portions, the cerebro-spinal and the vegetative. The *cerebro-spinal nervous system* consists of the brain enclosed within the bony walls of the skull, the spinal cord occupying a canal in the centre of the vertebral column (spine), and the various nerves that issue from brain or cord. The nerves springing from the brain are called cranial nerves; those issuing from the spinal cord spinal nerves. From the interior of the skull the brain passes down through a large bony aperture at the skull base, and becomes then the spinal cord, which extends down to the lumbar region of the spine.

The *vegetative nervous system* is a complicated system of ganglia (ganglion = a group of nerve cells) and nerve fibres which innervate the muscular fibres that are present in the internal organs, digestive tubes, and glands. It is developed from the cerebro-spinal system, and remains connected with it. It is not under the control of the will and it governs all the important life-sustaining processes such as respiration, circulation, and digestion. To it we owe our general sense of bodily well-being in health and the feelings of distress or pain when vital functions are interfered with.

Within the skull the brain is divided into four main parts, viz.:

1. The *cerebrum* or large brain which fills the entire cavity of the upper part of the skull and represents about seven-eighths of the whole brain. It is divided into two halves, one on each side, the right and left cerebral hemispheres. Its surface is increased in area by being thrown into folds or convolutions, which form the cerebral cortex or bark. The cortex consists of a thick layer of grey nervous matter made up of nerve cells, whilst the interior of each hemisphere contains white matter made up of conducting nerve fibres.

2. The *cerebellum* or small brain is situated in the back of the skull, below and behind the cerebrum. It is a highly important part, and its surface is very finely convoluted.

3. The *medulla oblongata* or bulb, which is placed far down, lies in front of the cerebellum, and connects the brain with the spinal cord.

4. The *pons varolii*, which is a broad band of nervous tissue lying above the medulla and connecting it with the cerebrum and also with the cerebellum.

The *spinal cord* is about 18 inches long and one-third to half an inch in diameter. In its passage through the spinal canal it gives off thirty-one pairs of nerves which emerge from each side of the cord by two roots, an anterior (motor) and a posterior (sensory) root. These roots unite and form nerve trunks which contain fibres subserving both motion and sensation, and are therefore usually known as mixed nerve trunks. The posterior roots contain chiefly afferent nerve fibres, i.e. fibres conveying impressions (usually of sensation) into the central nervous system; the anterior root fibres are those of a great efferent system and subserve the conduction of motor impulses from the brain and spinal cord outwards to the muscles. The mixed nerve trunk therefore is both afferent and efferent, or motor and sensory. The *spinal cord* on cross-section shows a central H-shaped collection of grey matter, the points of the H being usually referred to as horns, anterior and posterior on each side. Surrounding the grey matter and forming the outer zone of the cord on section is white matter made up mainly of fibres which run up and down. These fibres connect the brain with the cord and thence with the various mixed nerves of the body and vice versa; they also connect different nerve cells in the cord with one another.

We may now consider the various parts of the cerebro-spinal system from the point of view of function, but it is necessary first of all clearly to understand the meaning of *reflex action.* When a stimulus falls on a sensory surface (e.g. skin) or sense organ (called receptor) the stimulus, of whatever nature, gives rise to an impulse which passes along an afferent fibre in a mixed nerve and reaches the spinal cord via one of the posterior roots. In the cord it travels through a number of neurons in the grey matter, becomes modified, and finally leaves the cord via an efferent fibre in an anterior root to reach and throw into action some muscle or gland. This pathway is called a reflex arc and consists of (1) a receptor; (2) afferent nerve fibre; (3) neurons in spinal cord; (4) efferent nerve fibre; (5) muscle or gland. If the reflex arc is interrupted at any part (by disease or injury of the cord or nerves), then the reflex action dependent on its integrity is abolished. The *spinal cord,* it may now be noted, is a series of centres for reflex actions. It is in addition a conductor conveying impulses which originate in the higher nerve centres in the brain to all the different parts of the body, via the efferent fibres in the spinal mixed nerves. Impressions from the skin, muscles, &c., painful or otherwise, pass along the afferent fibres to the cord via the posterior roots and thence are conducted upwards to the brain. The *medulla oblongata* also acts as a reflex centre, and serves as a conducting path for impulses passing between the brain and cord. Some most important and vital reflexes are effected through the medulla, e.g. those regulating the heart's action and the calibre of the blood vessels and those regulating the breathing and movements of the stomach (e.g. vomiting). The *pons varolii* contains centres for certain important cranial nerves (e.g. the facial), which centres are innervated from the cerebral cortex. It connects through certain fibres the cerebrum with the cerebellum and it also contains many fibres subserving upward and downward conduction between brain and cord. The *cerebellum* is intimately concerned in the power of maintaining the equilibrium of the body, and with the capacity of making the co-ordinated bodily movements characteristic of a healthy person. If a bird have its cerebellum removed, attempts to fly only result in chaotic and futile movements of its wings and equally futile are the attempts of a quadruped to walk, under the same circumstances. The *cerebral cortex* is a recent addition to the nervous system from the evolutionary point of view. Certain lower animals have no cerebral hemispheres worth speaking of, but as we ascend the scale the cerebral cortex becomes more and more prominent, and in man the cerebral hemispheres form the greater part of the brain. The *cerebrum* receives stimuli, and can give effect to them by means of efferent impulses; but it also registers stimuli, producing a permanent record, and so subserves memory. An animal without a cerebral cortex can carry out reflex movements co-ordinately through the cerebellum, &c., but it has no volition, or intelligence. The cerebral grey matter is very rich in cells, and highly differentiated. Disease in man and experiments in animals have shown that different areas of the cerebral cortex subserve different functions. There is, for example, a special motor area, interference with which produces paralysis, a special visual area, a special speech area, &c. The farthest forward parts of the cerebrum (frontal lobes) are especially concerned with the intellectual processes, and reach their greatest development in the human cerebral cortex.

Diseases of the nervous system are broadly classified as functional and organic. In the latter there are obvious naked-eye or microscopic changes in structure. The former are not characterized by any detectable degenerative change: they include such conditions as neurasthenia, hysteria, shell shock, where the symptoms are mainly nervous though not associated with any known change in brain, spinal cord, or nerves. —BIBLIOGRAPHY: E. A. Schäfer, *Textbook of Physiology*; W. D. Halliburton, *Handbook of Physiology*; J. R. Whitaker, *The Anatomy of the Brain and Spinal Cord*; J. R. Angell, *Psychology*; C. S. Sherrington, *The Integrative Action of the Nervous System.*

Ness, Loch, a lake of Scotland, in Inverness-shire, part of the Caledonian Canal. It is long and narrow, in the valley of Glenmore. Length, about 22 miles; breadth, 1½ to 2 miles; greatest depth, about 130 fathoms. The outlet of the lake is by the River Ness (famous for its salmon-fishing) into the Moray Firth.

Nest, the place where a bird lays its eggs, hatches them, and shelters its young until they are fledged. The materials used are extremely various, being such as mud or clay, twigs or branches, leaves, grass, moss, wool, feathers, &c. Some birds, for the sake of protection, excavate burrows in banks or sandy cliffs in which to make their nests. Many mammals also are nest-builders, notably mice, moles, dormice, squirrels, foxes, weasels, badgers, rabbits, &c.; and nests are also constructed by certain fishes, reptiles, crustaceans, insects, &c.

Nestor, one of the Greek heroes at Troy, son of Neleus, King of Pylos, who took part in the hunting of the Calydonian boar, and in the Argonautic expedition. He is noted as the wisest adviser of the chiefs before Troy, after the fall of which he retired to Pylos, where he lived to a great age.

Nestor, Russian historian, born about 1056, was a monk at Kiev, and died in 1114. He wrote a *Chronicle* in his vernacular tongue, which has been the foundation of Slavonic history.

Nestorians, a Christian sect of Western Asia, named from their founder Nestorius, formerly of greater importance than they are at present. One portion of them is united with the Roman Catholic Church though using the Greek ritual. They have a patriarch residing at Diarbekr. The larger body of them remains as a distinct sect, in Mesopotamia, Syria, Persia, &c. They recognize only three sacraments, baptism, the Lord's Supper, and ordination; and their priests are allowed to marry. There is a Nestorian body in India called Christians of St. Thomas.

Nesto'rius, heresiarch, was presbyter at Antioch and Bishop of Constantinople from A.D. 428 to 431. He incurred the charge of heresy by maintaining that in the person of Christ the two natures were not so united as to form but one person. Cyril of Alexandria, at the Council of Ephesus in 431, procured the condemnation of the doctrine taught by Nestorius and the deposition of the patriarch. He was banished to the deserts of Egypt, where he suffered much and died (440).—Cf. A. Harnack, *History of Dogma*.

Net, an open fabric made of thread, twine, or cord, woven into meshes of fixed dimensions, firmly knotted at the intersections. Nets are used for a great variety of purposes, as for protecting fruit-trees, for collecting insects, for hammocks, screens, &c., but chiefly for hunting and fishing. The chief kinds of nets used in fishing are the trawl, the drift, the seine, the kettle or weir, and the trammel or set nets. The trawl is a triangular bag with an arrangement for keeping its mouth open, drawn along the bottom of the water. The drift and seine nets are very long in proportion to their breadth, and differ from each other only in the manner in which they are employed. The seine has a line of corks along one of its long borders, and a line of leaden weights along the other; so that when thrown into the water it assumes a perpendicular position. It is used near the shore, being dragged to land, with any fish it may enclose, by ropes fastened to the ends. The drift-net also hangs upright, but is used in the open sea, and more especially in herring-fishing, the fishes as they drive against it becoming caught by the gills. Kettle and weir nets are structures fixed on stakes placed along the coast between high and low water. Trammel or set nets are also fixed between stays, but act like drift-nets. Formerly all nets were made by hand, but since 1820, when James Paterson established a machine-net factory at Musselburgh, hand-made nets have been superseded.

Netherlands, The, or **Holland**, in Dutch *Nederland*, or *Koninkrijk der Nederlanden*, a kingdom of Europe lying on the North Sea.

General Features.—The Netherlands form the most characteristic portion of the great plain of Northern and Western Europe. It is the lowest part of this plain, some portions of it being 16 to 20 feet below the surface of the sea, and nearly all parts too low for natural drainage. The coast-line is very irregular, and the country is protected from the sea by lines of dunes and artificial dikes; the dune-line has been broken through by the sea, and the submerged land behind it forms the Zuider Zee; the fragments of the broken barrier that once kept out the sea remain as the Frisian Islands. Almost the only heights are the sand-hills, about 100 to 180 feet high, forming a broad sterile band along the coast of South and North Holland; and a chain of low hills, of perhaps similar origin, south-east of the Zuider Zee. The highest elevation, 656 feet, is in the extreme south-east. The general aspect of the country is flat. It comprises eleven provinces, as follows:

Province.	Land Area. Square Miles.	Population, 31st Dec., 1919.
Guelders	1,939	726,390
North Brabant.. ..	1,920	729,011
Overijssel	1,295	435,047
Friesland	1,243	385,362
South Holland.. ..	1,131	1,664,284
North Holland.. ..	1,066	1,288,826
Drenthe	1,028	206,879
Groningen	881	363,077
Limburg	847	450,012
Zeeland	707	246,882
Utrecht	525	335,461
Total	12,582	6,831,231

The census of Dec., 1920, showed a population of 6,841,155. Including interior waters, the area (1909) was 13,196 sq. miles, and the total area, inclusive of gulfs and bays, amounted to (1909) 15,760 sq. miles. The principal towns and their populations at the 1919 census were:

Amsterdam,	647,120.	Haarlem,	77,302.
Rotterdam,	506,067.	Arnhem,	71,002.
The Hague,	359,610.	Nimeguen,	66,833.
Utrecht,	138,334.	Tilburg,	61,557.
Groningen,	89,030.	Leiden,	61,408.

Colonies.—Holland is the third colonial power, and her possessions may be divided as follows:

Dutch East Indies (area, 683,000 sq. miles; pop. 47,000,000), comprising Java and Madura, Sumatra, Riau-Lingga Archipelago, Banca, Billiton, Borneo (part of), Celebes, Moluccas, Timor, Bali, and Lombok. *Dutch West Indies*, comprising Surinam or Dutch Guiana (area, 46,060 sq. miles; pop. 110,000); Curaçao, a colony made up of two groups of islands, viz. Curaçao, Aruba, and Bonaire in the first group; St. Martin (southern half), St. Eustache, and Saba in the second group. Area, 403 sq. miles; pop. 56,000. (All the above colonial figures are approximate.)

Internal Communication.—The chief rivers of the Netherlands are the Rhine, Maas (or Meuse), Scheldt, and Ijssel. The navigable canals, having a total extent of 2000 miles, are collectively more important than the rivers. The chief are the North Holland Canal, between Amsterdam and the Helder, length 46 miles; and the more important ship canal, 15 miles long, 28 feet deep, and 200 feet wide, from the North Sea to Amsterdam, and connected by locks with the Zuider Zee. There are about 3000 miles of roads and (1919) about 1830 miles of tramways. Railways are on the 4-foot-11-inch gauge, and the two principal lines had (1919) a length of 2377 miles. All railway concerns, four in number, are private.

Climate.—The mean temperature is not lower than in like latitudes in the British Islands, and the quantity of rain (26 inches) is somewhat less; but the winter is much more severe.

Production: Agriculture.—Wheat, rye, barley, oats, buckwheat, peas, beans, mustard seed (brown and white), carraway seed, flax, tobacco, potatoes, sugar-beets, chicory, onions. In the provinces of Zeeland, South Holland, North Holland, and Groningen, large estates predominate; small estates are confined to North Brabant, Limburg, Overijssel, and Guelders. Dairying is progressive, and much cheese, butter, and margarine are produced and exported, notably to the United Kingdom.

Fisheries. — There are herring and oyster fisheries, employing about 6000 vessels of all kinds.

Minerals.—Coal is found in the province of Limburg. The total output for the whole country in 1921 was 3,927,000 tons. There are three State and four private mining concerns. Lignite, peat, and salt at Boekelo are also worked.

Commerce.—Holland is a free-trading country, and such duties as exist are not in the nature of a protectionist tariff. The following are the principal imports, and, in parentheses, the chief sources of supply: coal (Germany, Belgium, United States, Britain); Wheat (Belgium, United States); maize (United States); linseed (Argentine); timber (Germany, Finland, Sweden); copra (Dutch East Indies); cotton yarns (Britain); nitrate of soda (Chile); flour (United States, British India); iron and steel (Germany, Belgium); petrol (United States, Mexico); raw coffee (Brazil, Dutch East Indies); barley (United States, Roumania); rails (Germany, Belgium); motor-cars (Germany, United States); fuel oil (Mexico); boots (Britain).

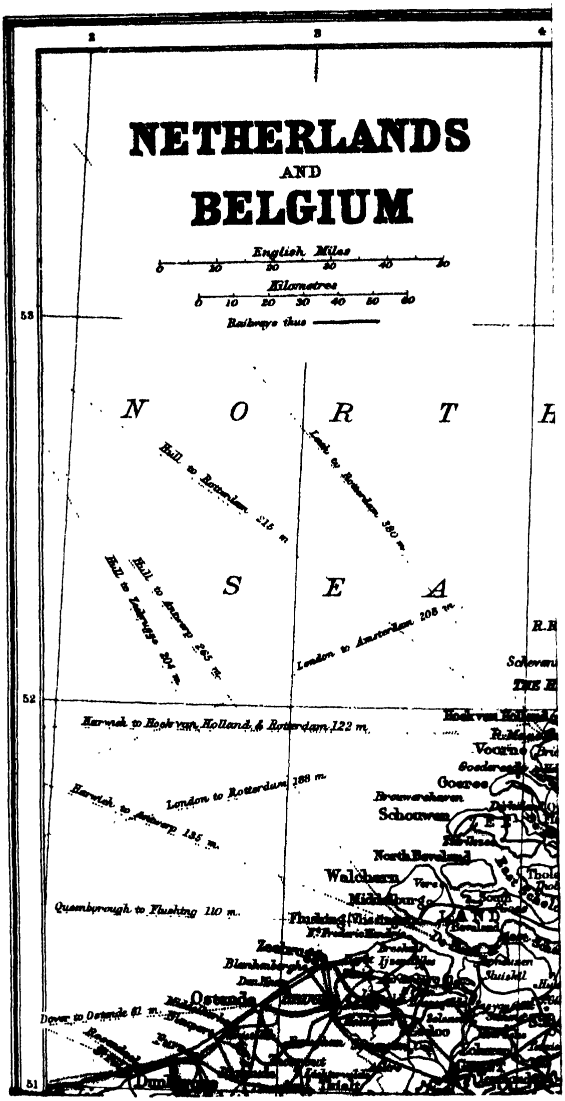
Currency, &c.—Silver is the money chiefly in circulation. The standard coin is the 10-florin piece (6·048 grammes of fine gold), and the unit of silver coinage is the gulden (florin, 9·45 grammes of fine silver). The gulden (guilder or florin) of 100 cents = 1*s.* 8*d.*, i.e. 12 = £1 at normal rates of exchange. The rijksdaalder = 2½ guilders. There are gold pieces of 10 guilders and of 5 guilders; coins of ½, ¼, and ⅒ guilder; 5 cent pieces in nickel; and ½ cent, 1 cent, and 2½ cent pieces in bronze. The metric system of weights and measures is in force.

People, Institutions, &c.—The stock to which the people belong is the Teutonic, the great majority of the inhabitants being descendants of the old Batavians. They comprise over 70 per cent of the population, and are chiefly settled in the provinces of North and South Holland, Zeeland, Utrecht, and Gelderland. The Flemings of North Brabant and Limburg, and the Frisians, inhabiting Friesland, Groningen, Drenthe, and Overijssel, form the other groups. In religion the growth of Roman Catholicism is marked. The provinces of North Brabant and of Limburg have always been pre-eminently Roman Catholic, and the Protestant strongholds are the provinces of the north-east, Friesland, Groningen, and Drenthe. In Gelderland, North and South Holland, and Overijssel the Roman Catholic minority is very large and increasing. There is no State Church, but the Budget makes fixed allowances for all the Churches, the proportions being (about): Protestant, 1,388,000 guilders; Roman Catholics, 576,000 guilders; and Jews, 14,000 guilders. The adherents of the various bodies (1909 census) are given as:

Dutch Reformed	2,588,621.
Other Protestants	746,186.
Catholics	2,053,021.
Jansenists	10.082.
Jews	106,909.
Other creeds and Atheists, &c ..	358,158.

Political parties are mainly divided on religious lines.

Government.—The Government is a constitutional monarchy on British lines, the succession to the throne being vested in the male line of the Royal House of Orange-Nassau, but passing in default of male heirs to the female issue. The sovereign attains majority at the age of eighteen years. The Crown possesses large exe-


NETHERLANDS
AND
BELGIUM
English Miles
0 10 20 30 40 50
Kilometres
0 10 20 30 40 50 60
Railways thus
2
3
4
53
52
51
N O R T H
S E A
Hull to Rotterdam 215 m.
Leith to Rotterdam 380 m.
Hull to Antwerp 245 m.
Hull to Zeebrugge 204 m.
London to Amsterdam 208 m.
Harwich to Hoek van Holland & Rotterdam 122 m.
London to Rotterdam 188 m.
Harwich to Antwerp 135 m.
Queenborough to Flushing 110 m.
Dover to Ostende 61 m.
Hoek van Holland
Voorne
Goedereede
Goeree
Brouwershaven
Schouwen
North Beveland
Walcheren
Veere
Middelburg
Flushing (Vlissingen)
Zeebrugge
Blankenberghe
Ostende
Dunkerque
Tholen
Schevening
THE H

cutive powers, and is assisted by a Council of State (14 members, nominated by the sovereign). The States-General (Parliament) consists of a First Chamber (50 members, elected for nine years indirectly by the provincial states, one-third seeking re-election every three years), and a Second Chamber (100 Deputies, elected for four years directly by single-member constituencies, and retiring in a body). Elections are by universal suffrage and proportional representation. Members of the Lower House are paid 3000 guilders annually.

Defence.—The navy is maintained for the dual purpose of coastal defence and colonial protection, and includes four coast-defence ships of two 9·4-in. and four 6-in. armament, one of two 11-in. and four 6-in. armament; a cruiser carrying two 5·9-in and eight 4·7-in. guns, and two others of ten 4·7-in. weapons. There are nine armoured gunboats in the East Indies. Other ships include twenty small destroyers, fourteen submarines (the O8, an interned vessel bought from Britain in June, 1917), a submarine depot ship, and twelve mine-layers. The peace strength of the Netherlands army (including 'landweers') is about 7900 officers and 262,300 men, with 156 field and 42 heavy guns. An additional 156,000 trained and 250,000 untrained men are available for mobilization. The infantry carries the Mannlicher magazine-rifle, model 95; cavalry and engineers are armed with the Mannlicher carbine; field artillery is armed with a shielded 7·5 cm. quick-firing Krupp gun.

Education.—Secular and sectarian instruction are separate. Education is compulsory between the ages of six and thirteen years. Private schools and institutions may be endowed by the State or by the community or province. In 1918–9 there were one private and four public universities (Leiden, Utrecht, Groningen, Amsterdam); one technical university; a high school of commerce (Rotterdam); thirteen navigation schools; thirty-four public (classical) schools; and other elementary, infant, 'middle-class', and 'working-class' schools. In addition, the veterinary school at Utrecht and the agricultural school at Wageningen were created universities in 1918.

Amsterdam is the commercial capital of the Netherlands; the seat of government and residence of the sovereign is at The Hague.

History.—The southern portion of the Low Countries belonged at the beginning of the Christian era to Belgic Gaul. The northern portion, inhabited by the Batavians and Frisians, formed part of Germany. The southern portion as far as the Rhine was held by Rome up to A.D. 400, after which it came under the rule of the Franks, as did subsequently the rest of the territory also. In the eleventh century the territory comprised in the present kingdoms of Belgium and the Netherlands formed a number of counties, marquessates, and duchies corresponding more or less with the modern provinces. By the latter part of the fifteenth century all these had been acquired by the Duke of Burgundy, and passed to the House of Habsburg on the marriage of the daughter of Charles the Bold to the son of the Emperor Frederick III. On the abdication of Charles V in 1556 they passed to his son Philip II of Spain. In consequence of religious persecution in 1576 Holland and Zeeland openly rebelled, and in 1579 the five northern provinces—Holland, Zeeland, Utrecht, Guelders, and Friesland—concluded the Union of Utrecht, by which they declared themselves independent of Spain. They were joined in 1580 by Overijssel, and in 1594 by Groningen. After the assassination of William of Orange, 10th July, 1584, Maurice became stadtholder. His victories at Nieuport and in Brabant, the exploits of the Dutch admirals against the navy of Philip II, the wars of France and England against Spain, and the apathy of Philip II caused in 1609 the Peace of Antwerp. The independence of Holland was fully secured by the Peace of Westphalia. In the middle of the seventeenth century the United Netherlands were the first commercial state and the first maritime power in the world, and for a long time maintained the dominion of the sea. The southern provinces alternated between the rule of Spain and Austria till 1797, when they came under the power of the French Republic. In 1806 Louis Bonaparte became King of Holland, but in 1810 it was incorporated with the French Empire. In 1815 (Congress of Vienna) all the provinces of modern Holland and Belgium were united by the Treaty of Paris to form the Kingdom of the Netherlands. This arrangement lasted till 1830, when the southern provinces broke away and formed the Kingdom of Belgium. King William I attempted to reduce the revolted provinces by force; but the Powers intervened, and finally matters were adjusted between the two countries in 1839. (See *Belgium.*) The king abdicated in 1840, and was succeeded by his son Willem II (1840–9), he being again succeeded by his son Willem III, who died in 1890, leaving his ten-year-old daughter Wilhelmina as queen under the regency of the queen-mother, Emma. The queen attained her majority on 31st Aug., 1898, and during the South African War Holland was decidedly in sympathy with the Boer cause, affording refuge to the fugitive President Kruger. Queen Wilhelmina married Prince Henry of Mecklenburg-Schwerin on 7th Feb., 1901, and the heir-apparent, Princess Juliana, was born in 1909. During the European War Holland maintained a large army to protect her neutrality, and many British troops were interned at Groningen after the fall of Antwerp. Holland afforded a refuge to the ex-Kaiser and to the Kronprinz Wilhelm on the fall of the German Empire.

Language and Literature.—The literary language of the Kingdom of the Netherlands is in English called *Dutch*, but by the people themselves is called *Hollandsch* or *Nederduitsch*, that is, Low Dutch. This name it receives in opposition to the *Hochdeutsch* or High Dutch, the literary language of modern Germany. Closely allied to the Dutch is the Flemish language. Both languages belong to the Low German group of the Teutonic or Germanic branch of the Indo-European family of languages. The two languages, or rather dialects, are in fact in their early history identical. What may strictly be called Dutch literature, as distinguished from Flemish, dates from the last quarter of the sixteenth century. The chief names of this period are those of Coornhert, von Marnix, Spiegel, and Visscher, who did much to polish and regulate the language, and to produce correct models both of prose and verse. Pieter Corneliszoon Hooft (1581–1647) brought the prose style to a high degree of excellence; and Joost van den Vondel (1587–1679), the greatest of Dutch dramatists, performed the same service for the language of poetry. Jacob Cats, familiarly known in Holland as ' Father Cats ' (1577–1660), on the other hand, confined himself to the sphere of everyday life. He was distinctively the poet of the people, and his writings are still popular. Among other leading names in pure literature are those of Constantyn Huygens (1596–1686), a satirist, epigrammatist, and didactic poet; Jacob van Westerbaan (died 1670) and Jan van Hemskerk (died 1656), both erotic poets; and Dirk Kamphuisen (died 1626), a celebrated hymn-writer. Among dramatists were Brandt (died 1685), who was also an historian and epigrammatist; Oudaan (died 1692), a political writer and lyrist; and Antonides van der Goes (died 1684), celebrated also as a lyrist. The principal writer of comedies was Bredero (1585–1618). Dutch poetry declined towards the end of the seventeenth century partly through French influence, but a revival set in with Jacob Bellamy (1757–86). Willem Bilderdijk (1756–1831) shone in all departments of poetry. J. F. Helmers (1767–1813) won great applause by the descriptive poem *De Hollandsche Natie*. Hendrik Tollens (1780–1856) was as a lyrist the avowed favourite of his country, and his *Overwintering der Hollanders op Nova-Zembla* is regarded as the best descriptive poem in the Dutch language. An important service was rendered to the literature of his country by Jacob van Lennep (1802–68), who, incited by the example of Scott and Byron, introduced romanticism, and successfully repressed French classicism by his masterly treatment of native tales and historical subjects in narrative poems. The novelists who rank next to van Lennep are Oltmans, Mrs. Bosboom-Toussaint, and Douwes Dekker (Multatuli). The list of later Dutch prose writers also includes Schimmel, N. Beets, W. A. van Rees, Weitzel, Lange, J. ten Brink, Opzoomer, Limburg-Brouwer, and the historians Fruin (called the Dutch Motley) and Hofdijk, the dramatist H. Heijermans, the poets Boutens, H. Gorter, and others. Dutch names famous in classical learning include those of Erasmus, Lipsius, Grotius, Gronovius, &c.; in science, Huygens, Leeuwenhoek, &c.; in philosophy, Spinoza; and in medicine, Boerhaave.

BIBLIOGRAPHY: *The Netherlands* (in *Peace Handbooks*, vol. v; H. M. Stationery Office, with a bibliography); Dr. A. Heringa, *Free Trade and Protection in Holland*; G. W. Edwards, *Holland of To-day*; W. E. Griffs, *Young People's History of Holland*; D. C. Boulger, *Holland and the Dutch*; J. C. A. Everwijn, *Beschrijving van Handel en Nijverheid in Nederland* (an abstract is published in English entitled, *A General View of Trade and Industry in the Netherlands*).

Netley, a village of England, in Hampshire, on Southampton Water; served by the London & South-Western Railway. The Royal Victoria Hospital was erected at Netley in 1857 as a military hospital, and has accommodation for 1000 patients. Candidates for the Army Medical Service are partially trained in this hospital. There are ruins, in the vicinity, of a Cistercian monastery founded in 1239–40.

Nettle, a genus of plants (Urtica) belonging to the nat. ord. Urticaceæ, and consisting chiefly of neglected weeds, having opposite or alternate leaves, and inconspicuous flowers, which are disposed in axillary racemes. The species are mostly herbaceous, and are usually covered with extremely fine, sharp, tubular hairs, placed upon minute vesicles filled with an acrid and caustic fluid, which by pressure is injected into the wounds caused by the sharp-pointed hairs. Hence arises the well-known stinging sensation when these plants are incautiously handled. Many species of nettle are known, of which three are found in Britain—the Roman nettle (*U. pilulifera*), the small nettle (*U. urens*), and the great nettle (*U. dioica*). Nettles yield a tough fibre which may be used as a substitute for hemp. Nettle-porridge and nettle-broth are dishes made from young and tender nettles cut in March or April.

Nettle-rash, or **Urticaria** (Lat. *urtica*, a nettle), a common disease of the skin, an eruption closely resembling nettle-stings both as to appearance and as to the sensations it originates. It consists of small wheals, either red or white, sometimes both, having the centres white and the margins red. The disease may be either acute or chronic. When it is acute, generally more or less of fever accompanies it. In almost all cases it arises from a disordered condition of the digestive organs, produced either by indigestible food, or in some persons by particular kinds of food which others eat with complete impunity.

Nettle Tree (Celtis), nat. ord. Urticaceæ, a deciduous tree, with simple and generally serrated leaves, much resembling those of the common nettle, but not stinging. It has a sweet fleshy drupaceous fruit. The common or European nettle tree (*C. austrālis*) grows to the height of 30 or 40 feet, and is frequently planted for ornament in the south of France and north of Italy. The wood is useful for various purposes. *C. occidentālis*, sometimes called the sugar-berry, is a much larger tree, often attaining a height of from 60 to 80 feet. It is a native of North America from Canada to Carolina. A variety, *C. crassifolia*, is often called hackberry. See *Hackberry*.

Neuchâtel (Ger. *Neuenburg*), a Swiss canton, bounded by France, Vaud, the Lake of Neuchâtel, and Bern. Neuchâtel was an independent principality as early as 1034. After various vicissitudes it came into the hands of the King of Prussia, as heir of the House of Orange. In 1814 it was received into the Swiss Confederacy, and was the only canton with a monarchical government, which it preserved till 1848. After threatened war in May, 1857, the King of Prussia renounced all his rights in Neuchâtel. The Lake of Neuchâtel, 24 miles long by 8 miles broad, communicates through the Aar with the Rhine. Grazing and dairy-farming are extensively carried on in the canton; wine, fruits, hemp, and flax are produced. The chief manufactures are lace, cotton, watches and clocks (specially at Chaux de Fonds and Locle). The people are mainly French-speaking Protestants. Pop. (1920), 130,670.—The capital, which has the same name, stands on Lake Neuchâtel, west of Bern. It has a castle, formerly the residence of the Princes of Neuchâtel, and now occupied by the Government offices; an old Gothic church of the twelfth century; and a gymnasium or college, containing a valuable natural history collection founded by L. J. R. Agassiz, a native of the town. Pop. (1920), 22,960.

Neumünster (noi′mün-stėr), a town of Schleswig-Holstein, Prussia, on the Schwale and on the Altona-Kiel Railway. It is the centre of the railway system of Holstein, and the second industrial town in the province, with cloth-factories, &c. The original name was Wipendorp, from an Augustine house of 1180. Pop. 34,550.

Neunkirchen (noin′kir*h*-ėn), or **Ober-Neunkirchen**, a town of Prussia, in the district of Trèves, on the Blies, 12 miles north-west of Saarbrücken. It lies in a great coal-basin, and has a large iron-foundry employing about 3000 hands. Pop. (district), 70,540.

Neuquén, a mountainous territory of the Argentine, traversed by the Neuquén, an affluent of the Rio Negro. Lake Nahuel-Huapi (q.v.) is in the territory. Large numbers of cattle, sheep, horses, &c., are reared. Area, 40,530 sq. miles; pop. (1920), 32,500.

Neural′gia, the name given to that species of morbid pains which occur only in the course of one or more distinct nerves, and by this locality are distinguished from other pains. In neuralgia of the fifth nerve the pain is in one half of the face, and if the central branch is affected the pain is confined to the upper jaw; neuralgia of the chief nerve of the thigh (*sciatic nerve*) extends along the buttocks and back of the thigh down to the knee, and is called *sciatica*. It also affects the front, back, and outside of the leg, and the whole foot except its inner border; while neuralgia of the intercostal nerves manifests itself in a belt or circle of pain around the breast. The presence of neuralgia almost invariably indicates a weak state of the general system. The most common and best ascertained of the neuralgias are those of the nerves of the skin (*dermalgia*); but nerve pains occur also in other parts, as in the joints, muscles, and in the bowels (*enteralgia*). Many of the internal parts may be the seat of similar local affections; such, for example, are nervous affections of the heart and respiratory organs, which, however, do not usually manifest themselves by acute pain, but by special symptoms. The primary causes of the injury to the nerve producing neuralgia may be very various. It may be inflammation of the nerve itself, a swelling in or upon it, irritation of it produced by an ulcer or suppuration or swelling of the adjacent parts, especially the cavities of the bones, &c. Thin-blooded persons and those of weak nerves are most liable to be affected by neuralgia, which varies much both in degree and duration. It is often chronic, and often suddenly occurs during the progress of other acute diseases, as in typhus or intermittent fevers. The treatment also of course varies with the nature of the different cases, some admitting of easy cure by the administration of nourishing food, and by the use of iron and quinine, and other tonics, while for others the aid of surgery has to be called in.

Neurop′tera, an order of insects which undergo an incomplete metamorphosis, distinguished by the possession of four well-developed membranous wings, which are generally of equal or nearly equal size. The name Neuroptera (‘ nerve-winged ’) is applied to the group in allusion to the large size of the nervures or supporting ‘ ribs ’ of the wings, which are very conspicuous and give to the wings a reticulated or network-like appearance. The mouth is generally masticatory, the head large and distinctly separable from the thorax, the antennæ usually slender. The tarsi possess from two to five joints. No sting exists. In some Neuroptera the metamorphosis may approach very nearly to the holometabolic or 'complete' variety. In general the larvæ are aquatic, the pupa in the majority of cases closely resembling the perfect insect. The chief families included in the order comprise the Libellulidæ or dragon-flies; the caddis-flies (Phryganeidæ); the may-fly family (Ephemeridæ); the Myrmeleontidæ, or 'ant-lions'; the Hemerobiidæ, or 'lace-winged flies'; and the Termitidæ, represented by the celebrated 'white-ants' or termites of tropical regions. See the different articles.

Neuro'sis. See *Nervous System*.

Neurot'ic, a term introduced into medicine to indicate some relationship to the nervous system. Thus a neurotic disease is a nervous disease. So medicines that affect the nervous system, as opium, strychnine, &c., are called *neurotics*.

Neusatz (noi'zàts), or **Novi Sad** (Ujvidek), a town of Yugo-Slavia, formerly in Hungary, on the Danube, opposite Petervarad, on the main line to Belgrade. Pop. 33,080.

Neusiedler See (noi'zēd-lėr zā), or **Lake Neusiedl,** a lake on the Austro-Hungarian readjusted frontier. It is salt and shallow, and water has several times disappeared from it entirely. The last occasion was between 1865 and 1870, when crops were grown on its bed and the remains of lake dwellings were made visible.

Neu-Strelitz, a town and capital of Mecklenburg-Strelitz, between Lakes Zierk and Glambeck. It is regularly built in the form of a star, the eight rays of which converge on a spacious market-place, and there is a palace, which formed the residence of the reigning grand-dukes until 1918. It contains a collection of over 100,000 books. Pop. 12,000.

Neu'stria, in the geography of the Middle Ages, the western kingdom of the Franks, in the north of France, so called in opposition to *Austrasia* (Austria, Oestreich), the eastern kingdom of the same. On the death of Clovis (511) his sons divided his territories into two parts, which received these names. Neustria lay between the Meuse, the Loire, and the ocean.

Neuter, in zoology, a term applied to indicate those insect forms—represented chiefly among the ants, bees, and wasps—in which the characteristics of sex are either present in a rudimentary condition or may not be developed at all. Thus among the ants the community consists of males, females, and neuters, or 'workers' as they are also termed. These ant-neuters are simply (sexually) undeveloped females, and upon these forms the performance of all the laborious duties of the ant-colony devolves. In the bees the neuters, or workers, are similarly sterile females. The differences between the fertile females and neuters—both of which are developed from fertilized ova—appear to be produced through differences in the food upon which the respective larvæ are fed, and through similar and surrounding circumstances which affect the nutritive development of the larvæ. Plenty of food is thus said to produce females, and a scantier or different dietary males or neuters. See *Parthenogenesis*; *Ant*; *Bee*; *Wasp*.

Neutral'ity, in international law, that state of a nation in which it does not take part, directly or indirectly, in a war between other nations. The term *neutral,* or *neutrales,* dates from the fifteenth century, *medii,* or *medii amici,* being its equivalent in classical Latin. To maintain itself in a state of neutrality a nation is often obliged to assume a threatening position, to be able to repel, in case of necessity, every aggression on the part of either of the belligerents. Such neutrality is termed an *armed neutrality*. In maritime wars the treatment of effects of the enemy on board neutral vessels, or neutral effects on board a hostile vessel, gives rise to very important questions. In former times the principle was pretty generally admitted, that the ownership of the goods on board of the vessels was the only point to be considered, and not the property of the vessels themselves. The belligerents, therefore, seized merchandise belonging to the enemy on board of neutral vessels; but they restored neutral property seized under the enemy's flag. But the endless investigations which this system caused, since a consequence of it was the searching of neutral vessels, produced by degrees a new and totally contrary principle, that the flag protects the cargo. The plenipotentiaries of Great Britain, Austria, France, Prussia, Russia, Sardinia, and Turkey, assembled at Paris in April, 1856, agreed that the neutral flag should cover an enemy's goods, with the exception of contraband of war; and that neutral goods, with the exception of contraband of war, are not liable to capture under the enemy's flag. In the arbitration (in 1872) at Geneva of the *Alabama* claims of the United States against Great Britain, three rules were agreed to by the parties, to the effect that a neutral Government is bound to use due diligence to prevent the fitting out in, or departure from, any of its ports of a vessel which it has reasonable ground to believe is intended to carry on war with a power with which it is at peace; that it is bound not to permit a belligerent to make use of its ports as a basis of naval operations, or a source of recruitment of men or military supplies; that it is bound to exercise due diligence in its own ports or waters, and as to all persons within its jurisdiction, to prevent any violation of these duties and obligations. Certain states, such as Belgium and Switzerland, have been made permanently neutral, i.e. have been neutralized. They are bound to observe neutrality, and as long as they observe it, the guaranteeing powers undertake to protect them from attack. The immediate cause of Britain's entry into the European War was the invasion of Belgium by Germany, one of the guaranteeing powers.—BIBLIOGRAPHY: W. E. Hall, *Rights and Duties of Neutrals*; C. F. Wicker, *Neutralization*; J. Westlake, *International Law*; Sir T. E. Holland, *Studies in International Law*.

Neuve Chapelle, a village of France, in the department of Nord, seized by the Germans and retaken by Indian troops during Oct., 1914. It was practically destroyed during the European War, and was 'adopted' by Blackpool. For the battle of Neuve Chapelle, 10th to 12th March, 1915, see *European War*.

Neuwied (noi′vēt), a town of Rhenish Prussia, 7 miles below Coblentz, on the right bank of the Rhine. It contains a palace, and has an establishment of the Moravian Brethren, who amount to 500 or 600 individuals, and have excellent schools, which are attended by many English pupils. Pop. 19,100.

Neva, a river of Russia, which issues from Lake Ladoga, and flows into the Gulf of Finland below Petrograd by several mouths. It is generally frozen over from October to April. Its commercial importance is enhanced by canals.

Neva′da, a state in the mountain division of the United States, lying wholly within the Great Basin at a mean altitude of 5500 feet. The surface is rugged; mountain spurs and isolated ranges traverse the state, which is drained mainly by the Humboldt, falling into Humboldt Lake. The Colorado River forms the south-eastern boundary. Carson City (pop. about 3000) is the state capital; Reno (pop. 1920, 12,016) is the largest town. Three main lines traverse the state from east to west, the Southern Pacific and the Western Pacific in the north, and the San Pedro, Los Angeles, & Salt Lake system in the south. In 1917 there were 2293 miles of steam and (1919) 11 miles of electric track. Roman Catholicism is the predominant religious faith. Nevada has some agriculture, corn, wheat, barley, and potatoes being produced; stock-raising and sheep-farming are important; there were 4,971,885 acres of national forest-land in 1919. An irrigation scheme embraces 160,000 acres, but agricultural development is retarded by bad communications. In 1920, 54,267,175 acres were unappropriated and unreserved and available for settlement. Manufactures are unimportant, and are chiefly allied with agriculture; but the state is exceptionally rich in minerals, gold (value, 1919, 6,619,937 dollars), silver (1919, 10,000,599 dollars), copper, lead, zinc, graphite, iron, mercury, tungsten, sulphur, gypsum, and stone being worked. Education is compulsory between the ages of eight and sixteen years; there is a State university at Reno (founded 1886). The Indian Reserve has an area of 1127 sq. miles; pop. (1919), 5840. State area, 110,690 sq. miles (869 sq. miles being water); pop. (1920), 77,407. Nevada was admitted to the Union as a state on 31st Oct., 1864. The state is divided into seventeen counties. The present Government comprises a Governor, and a Legislature consisting of a Senate (17 members, elected for four years, one-half seeking re-election biennially) and a House of Representatives (37 members, elected for two years). Two Senators and one Representative are sent to Congress.—Cf. S. Davis, *History of Nevada*.

Nevers (nė-vār), a town of France, capital of the department of Nièvre, on the right bank of the Loire, 153 miles S.S.E. of Paris. It is the see of a bishop, and has a cathedral (in part dating from the eleventh century, restored 1883), and a hôtel de ville. Nevers has potteries and porcelain-works, producing ware which has long been famed. The navy cannon-foundry, the largest ordnance foundry in France, was in 1881 turned into a practical school for boiler-making and engine-fitting. Pop. 27,700.

Neville's Cross, a cross near Durham, erected by Ralph Neville to commemorate the battle fought there between the Scottish and English forces, 17th Oct., 1346. The Scots were totally defeated, and their king, David Bruce, was taken prisoner. The cross was destroyed in 1589.

Nev′is. See *St. Kitts' and Nevis*.

New Albany, a city of Indiana, United States, county seat of Floyd county, on the Ohio; served by the Chicago, Indianapolis, & Louisville Railway. Automobiles and iron goods are manufactured. There are abattoirs, canneries, &c. New Albany became a city in 1893. Pop. about 24,000.

Newark, a city and port of entry of New Jersey, United States, county seat of Essex county, on the Passaic; served by the Pennsylvania Railway and by an elaborate electric-traction system, and steamers. It is a great manufacturing city, and originated in Milford (1666), a colonial offshoot of Connecticut. It became a city in 1836. Pop. (1920), 414,524.

Newark, a municipal borough of Nottinghamshire, England, on the Devon; served by the Midland and Great Northern Railways. The corn-market is one of the largest in the kingdom. Iron-founding, brass-founding, brewing, and the manufacture of boilers and agricultural implements are carried on. The ruined castle was the scene of King John's death in 1216, was thrice besieged as a stronghold of the king during the

Civil War, and was the scene of the surrender of Charles I to the Scots army. Pop. (1921), 16,957.

New Bedford, a city and port of entry of Massachusetts, United States, the county seat of Bristol county, on the Acushnet River; served by the New York, New Haven, & Hartford Railway. It is a cotton-centre, and was at one time the centre of the American whale-fishery. The city was incorporated in 1812, and became a city in 1847. Pop. (1920), 121,217.

Newbern, a city of North Carolina, United States, the port of entry for Pamlico district, on the estuary of the Neuse. It has a large trade in lumber, tobacco, cotton, and naval stores. Newbern was founded by Swiss settlers in 1710. Pop. *c.* 10,000.

New Brighton, a watering-place of Cheshire, England, part of Wallasey, at the north-east corner of the Wirral Peninsula; served by the Wirral Railway and by ferry steamers connecting it with Liverpool and Birkenhead. It has excellent bathing, a fine promenade, and a landing-pier.

New Brighton, since 1898 a part of Richmond borough, New York City (q.v.), on Staten Island, 6 miles south-west of Manhattan.

New Britain (formerly the German colony of Neu Pommern or New Pomerania, Bismarck Archipelago), a Pacific island in the Australian territory of New Guinea, administered by the Commonwealth under League of Nations' mandate dated 17th Dec., 1920. The capital is Rabaul (pop. 800); but, until 1910, it was located at Kokopa (Ger. *Herbertshöhe*), on the Gazelle Peninsula; the principal harbour is Blanche Bay. There are European coco-nut plantations (42,848 acres in 1918). The island is traversed by a range of hills (The Father, 7500 feet) with several active volcanoes. It is afforested in parts, and has a warm, humid climate with a heavy annual rainfall. The indigenous population is of Melanesian origin and generally of good physique, excepting in the Gazelle Peninsula, where there is much disease. Bêche-de-mer ('pidgin English') is the *lingua franca* of the coast. Area (*Deutsches Kolonial Lexikon*), 18,100 sq. miles; (*British Foreign Office Report*), about 10,000 sq. miles; (*Australian Government Year-book*), 9200 sq. miles. Pop. (*German Census Report*), 42,926 enumerated, 42,700 estimated; approximate total 85,000.

New Brunswick, a maritime province of the Dominion of Canada, extending between the Bay of Fundy (south) and the province of Quebec (north), and connected with Nova Scotia by a narrow isthmus. The deeply indented coastal regions are flat; elsewhere the surface is undulating, rising to central and northern highlands among spurs of the Appalachians. The state capital is Fredericton (pop. 8000); St. John (68,000, 1922) and Moncton (22,000) are export seaports. There are 1959 miles of railway track in the state (1917), which is traversed by the Canadian Pacific, Canadian National (Grand Trunk), and the Maine Central Railways. The predominant religious beliefs are Roman Catholic and Baptist. Agriculture, mining, and fisheries are extensive; New Brunswick is of no importance in manufactures. Buckwheat (1920, 1,510,000 bushels), wheat (464,000 bushels), oats (9,118,000 bushels), potatoes (15,570,000 bushels), turnips (7,071,000 bushels), hay and clover (872,000 tons), and barley are produced. Butter (916,000 lb., value 505,000 dollars, 1919), and cheese (1,256,000 lb., value 348,000 dollars) are made; dairying and stock-raising are widely practised. A few manufactures are connected with agriculture and forestry (paper pulp). There are 10,000 sq. miles of forests in the state, consisting mainly of spruce used for paper pulp. These forests abound in moose and caribou. The fisheries (herring, salmon, lobster, and cod) employ about 17,000 hands, and the canneries, &c., another 7000. Coal and gypsum are widely worked; other minerals are stone, iron, manganese, copper, antimony, natural gas and oil (the latter near Moncton). Education is free and undenominational. The provincial university (founded 1800) is at Fredericton. Area, 27,985 sq. miles (74 sq. miles being water). Pop. 352,000.

New Brunswick was discovered by Jacques Cartier (1534), and was settled by the English in 1761, but the province actually dates from 1784, when it was separated from Nova Scotia. It entered the Federation of 1867. The Government consists of a Lieutenant-Governor and a Legislative Assembly (48 members, elected for five years), with a responsible ministry headed by a Premier. Ten Senators and eleven members of Parliament are sent to the Dominion Parliament at Ottawa.

New Brunswick, a city of New Jersey, United States, county seat of Middlesex county, on the Raritan; served by the Pennsylvania Railway and Delaware-Raritan Canal. The Dutch Reformed Church maintains Rutger's College and a theological seminary at New Brunswick. There are manufactures of india-rubber goods, paper-hangings, and machinery. It was settled in 1681, incorporated in 1736, and became a city in 1784, taking its name in 1714 to commemorate the accession of a member of the House of Brunswick to the throne of Great Britain. Pop. (1920), 37,779.

New'bury, a municipal borough in Berkshire, England, giving name to a parliamentary division, on the Kennet, which is made navigable to Reading, and joins the Thames. There are maltings and corn-mills, and a considerable traffic is carried on by the Kennet and Avon Canal.

During the Civil War two battles were fought in the vicinity, both resulting in victory for the Royalists. Pop. (1921), 12,290.

New'buryport, a city and port of entry of Massachusetts, United States, the county seat of Essex county, on the Merrimac; served by the Boston & Maine Railway. It was settled in 1635, incorporated in 1764, and became a city in 1851. Pop. (1920), 15,609.

New Caledonia, a French island of Oceania, in the Melanesia division of the Australasian festoon. It is about 250 miles long and 80 miles broad, and is crossed by two parallel ranges of mountains (Mount Humboldt, 5570 feet). Nouméa, the capital (pop. 10,000), is connected by a narrow-gauge railway (20 miles) with Paita, and has a harbour. Some of the inhabitants are of convict origin, but the majority are mixed Melanesian and Polynesian, with some Japanese, Tonkingese, Malays, and Javanese. No convicts have been sent to New Caledonia since 1896, and the convict element is gradually decreasing; the local penal settlement is on Nou Island. The average rainfall is about 40 inches. About 500 sq. miles of the island are afforested; the cultivable land produces coffee, copra, cotton, cassava, maize, tobacco, bananas, and pineapple; sheep and cattle are raised. New Caledonia is one of the world's store-houses of nickel, other exports being chrome ore and manganese, coffee, copra, rubber, guano, and preserved meats (canned). Imports are mainly coal, flour, rice, and wine. Public instruction is provided in public and private (municipal assisted) elementary schools; classical and technical education is given by the Collège la Pérouse at Nouméa. A cable runs from New Caledonia to Burnet Heads, near Bundaberg, Queensland. Area, 7650 sq. miles; pop. about 50,700.

Dependencies.—Isle of Pines (area, 58 sq. miles; pop. about 600); Wallis Archipelago (area, 40 sq. miles; pop. 4500), governed by a French Resident; Loyalty Islands (q.v.; area 800 sq. miles); Huon Islands, a barren group; Fatuna and Alofi, south of the Wallis Archipelago (pop. about 1500). See *Oceania*.—BIBLIOGRAPHY: D. Vallet, *La Colonisation française en Nouvelle-Calédonie*; R. H. Compton, *New Caledonia and the Isle of Pines* (*Geographical Journal*, Feb., 1917).

Newcastle, William Cavendish, Duke of, was born in 1592, died 1676. Son of Sir Charles Cavendish, he was made Earl of Newcastle by Charles I. On the approach of hostilities between the Crown and Parliament he embraced the royal cause, and was invested with a commission constituting him general of all His Majesty's forces raised north of the Trent, with very ample powers. Through great exertions and the expenditure of large sums from his private fortune he levied a considerable army, with which, for some time, he maintained the king's cause in the north. When the royal cause became hopeless he retired to Holland. He returned after an absence of eighteen years, and was rewarded for his services and sufferings with the dignity of duke. He was the author of several mediocre poems and plays, and a treatise on horsemanship. —His wife, Margaret (1624–74), also wrote poems and other works, including an autobiography, and a *Life* of the duke, " in its way a masterpiece ".

Newcastle, a town of New South Wales, Australia, on the Hunter River, and connected with Sydney by rail. It stands in the largest of the Australian coal-fields, to which it owes its existence as a town. Pop. 62,900.

Newcastle-under-Lyme, a municipal borough of Staffordshire, England, on Lyme Brook; served by the North Staffordshire Railway. Coal- and iron-mines and potteries are carried on in the neighbourhood. In the town itself a few industries are carried on, such as brewing, malting, tanning, and paper-making. By canal it is connected with the Trent, Mersey, Severn, and Thames. The High School was founded in 1662. The name is derived from the ancient Forest of Lyme (i.e. on the *limes* or marches of Cheshire). Pop. (1921), 20,418.

Newcastle-upon-Tyne, a city, county-city, and river-port of Northumberland, England, on the Tyne; served by the North-Eastern, Great Northern, North British, Midland, London & North-Western, Great Central, and other railways. Among the public buildings are the cathedral of St. Nicholas, rebuilt (1172–8) on the site of a foundation of 1091; the Roman Catholic cathedral of St. Mary; the Moot Hall, in which the assizes for the county are held; the keep and black gate or entrance to the castle, built by Henry II between 1172 and 1177, but founded originally in 1080 and rebuilt by William Rufus. Royal Infirmary (1906); and Armstrong College and the College of Medicine, which form part of the University of Durham. There is a series of fine bridges across the Tyne to Gateshead; one of these is the famous High Level Bridge of Robert Stephenson (length, 1375 feet, upper part 112 feet above high water); others are the Scotswood Suspension, Swing (1876), King Edward VII (railway), and Redheugh. Newcastle, owing to the rich mineral products of the neighbourhood, has attained a first position among the great centres of British enterprise. Some of the more important of its industries are shipbuilding and allied trades, the manufacture of locomotives and general engineering, electrical power distribution, and many manufactures. There are markets for cattle, fish, vegetables, and grain. Situated in the midst of one of the largest coal-fields in England, it exports immense quantities of coal. Newcastle is one of the Tyne ports (which include also North and South Shields).

Newcastle is situated at the eastern termination of the wall of Hadrian (A.D. 120). The castle or fortress was built by Robert, son of William the Conqueror, about 1080, about which time it received its present name. Newcastle was a frequent object of attack in the wars between England and Scotland. It was taken by the Scottish Covenanting army in 1640 and in 1644, and in 1647 Charles I was delivered here by the Scottish army to the parliamentary commissioners. After the European War Newcastle 'adopted' Arras (1920). Pop. (1921), 274,955.

Newchwang, a city and treaty-port of Fengtien province, China, on the Liaoho; served by the South Manchuria and the Peking-Mukden Railways. The port is ice-bound for three months annually. Pop. about 70,000.

New College, one of the colleges of Oxford University, founded in 1379 by William of Wykeham, Bishop of Winchester and Lord Chancellor of England.

Newcomb, Simon, American astronomer, born in Nova Scotia in 1835, died in 1909. He settled in the United States in 1853, and graduated in science at Harvard in 1858. In 1861 he became professor of mathematics in the United States navy, and later on occupied a high position at the Washington Observatory. In 1877 he was made director of the *American Nautical Almanac*, and in 1894 became professor of mathematics and astronomy in the Johns Hopkins University. Among his numerous publications are: *The Recurrence of Lunar Eclipses, Popular Astronomy*, and *Compendium of Spherical Astronomy* (with G. S. Holden).

New'comen, Thomas, a locksmith at Dartmouth, in Devonshire, born in 1663, died in 1729, one of the inventors of the steam-engine. The engine associated with his name used steam under pressure to raise the piston. The fall of the piston was caused by the pressure of the atmosphere above, and a partial vacuum below the piston. The vacuum was produced by the condensation of the steam by injected cold water. The merit of first applying the steam-engine to practical purposes is due to Newcomen, who worked in association with Captain Savery and John Calley.

New England, the north-east division of the United States, comprising the states of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut. The inhabitants are styled 'Yankees'. Originally called North Virginia when granted by James I to the Plymouth Company in 1606, it received the name of New England from Captain John Smith, who explored and made a map of the coast in 1614. Area, 61,976 sq. miles; pop. (1920), 7,400,856. (See articles on the six component states).

New Forest, a large tract in England, in the south-west of Hampshire, forming one of the royal forests, about 144 sq. miles (93,000 acres) in area, which is commonly said to have been laid waste and turned into a forest by William the Conqueror. There are several villages within the forest area, including Brockenhurst and Lyndhurst (the forest capital), both served by London & South Western Railway. Oak and beech are the principal trees. See *Hampshire.*

Newfoundland, an island in the North Atlantic, separated from the mainland of Canada by the Straits of Belle Isle, and forming, with its dependency Labrador, a dominion of the British Empire. Newfoundland does not form a part of the Dominion of Canada. It is the tenth largest island in the world, and is roughly one-third larger than Ireland. The coast (about 2000 miles) is irregular and deeply indented; low ranges of hills (Mount St. Gregory, 2226 feet) sweep down almost to the sea from summits only a few miles inland, the hinterland being generally undulating, interspersed with numerous lakes, rivers, and marshes. The population, therefore, is confined principally to the outposts on the coast, and the most densely inhabited area is in the south-east part of the island around St. John's (pop. 1918, 34,045), the capital city, which alone accounts for about one-eighth of the total insular population. Other towns are Harbour Grace (pop. 4279), Bonavista (pop. 3911), Carbonear (pop. 3540), and Twillingate (pop. 3348). The total area is 42,734 sq. miles; pop. (1920), 260,922, of which 133,085 were males. Both statements are exclusive of Labrador.

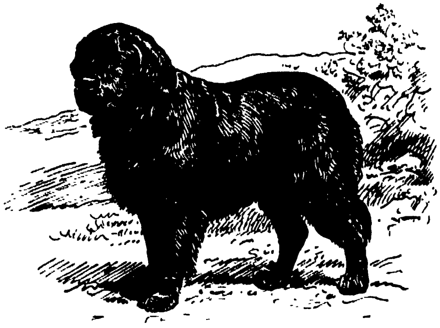
Communications.—In 1919 there were 904 miles of Government railway line (3-foot-6-inch gauge) and 47 miles of private line. The main line is from St. John's to Port-aux-Basques (545 miles); branch lines connect with terminals at Bonavista, Lewisporte, Heart's Content, Grate's Cove, Trepassey and Placentia, Millertown, Bonne Bay (projected), and Fortune (projected). Other communication is effected by steamer either to points along the coast or to the mainland.

Social Conditions.—Amongst the Newfoundlanders there are practically no rich people and comparatively few poor, the love of home and of home life being a pronounced national characteristic. In religion Roman Catholics as a sect are predominant, but Protestants (mainly Anglican, Methodist, and Salvation Army) form about two-thirds of the population. The religious element enters largely into the life of the community, and the population of many of the outposts frequently consists of a group of persons of the same creed or denomination. Liquor prohibition has been adopted, but, owing to the close proximity of the French islands of St. Pierre and Miquelon, a considerable amount of smuggling is carried on. Education is on the denominational system, and there are Church of England, Roman Catholic, and Methodist colleges. The legal coin of the Dominion is the gold dollar of 4*s.* 1⅛*d.* (normal) British.

Production.—Newfoundland generally is not climatically suitable for cereal-raising, opposed as it is to the frigid currents that flow down the west coast of Greenland, but the climate is not quite so bad as is generally represented, and there are no extremes as on the mainland. There is a long, cold winter and a considerable amount of rain, but farming is carried on extensively, and parts of the island are well adapted for stock-raising. Through the comparative shallowness of the soil the ordinary farm implements, such as spades, are unsuitable, and specially shaped ones are used. The chief agricultural products are hay, potatoes, cabbage, turnips, and some oats; sheep, swine, and cattle are raised, with some ponies for use in mines. Forests of the interior are utilized for the manufacture of paper pulp (at Grand Falls, Bishop's Falls, Lomond in Bonne Bay, &c.), which is sent to England for use in newspaper production. Mineral resources are extensive, coal, oil-shale, iron (on Wabana property, Bell Island, the third greatest hematite deposit in the world; at Bay St. George, a highly titaniferous magnetite of about 50 to 60 per cent iron and 2 to 12 per cent titanium), copper, lead ore, pyrites, chromite ores, manganese, molybdenite, gold, silver (all lead ores of Newfoundland are argentiferous), platinum, and many non-metallic minerals being found. Fishing is the oldest industry, and the governing factor which regulates the life and business of the community. Cod-fish is the principal catch, and is exported chiefly to Spain, Portugal, Brazil, Greece, Italy, and the United Kingdom. Seal-fishing is important in spring; lobsters are caught, and there is some whaling.

Newfoundland was discovered by John Cabot on 24th June, 1497, and was annexed in the name of Henry VII, who presented Cabot with the sum of £10 as a reward for his labours. In 1809 the government of Labrador was transferred from Canada to Newfoundland. During the European War Newfoundland provided nearly 15,000 men for the empire's service, a unit known as the Royal Newfoundland Regiment taking part in the Gallipoli, Egyptian, and Western Front campaigns, and being especially distinguished at Beaumont Hamel (1916) during the battle of the Somme. An additional body of about 3000 seamen (Royal Naval Reserve) was attached to the naval services.—BIBLIOGRAPHY: Captain E. J. Edwards, *Report on Trade and Industrial Resources of Newfoundland, 1922* (H.M. Stationery Office); D. W. Prowse, *A History of Newfoundland*; Lord Birkenhead, *The Story of Newfoundland*; *Modern Business Practice*, vol. ii (Gresham Publishing Company).

Newfoundland Dog, a breed originally peculiar to Newfoundland, now common in this country. In appearance it is large and handsome, with thick curly hair, either black or black-and-white in colour. The black-and-white variety is known as the 'Landseer', after that painter's well-known picture, and is probably a cross from the original breed, which was entirely black. The Newfoundland is a good retriever and a fine swimmer, and displays great courage and fidelity.



Newfoundland Dog

Newgate, the celebrated jail of the city of London, mentioned as a prison early in the thirteenth century. In the fifteenth century Sir Richard Whittington in his will left funds to rebuild it; it was rebuilt a second time after the great fire of 1666, and a third time in 1778–80, but required much restoration after the No Popery or Gordon Riots of 1780. It was demolished in 1902–3, and the Central Criminal Court (Old Bailey) now stands on its site.

New Guinea, an island of Oceania, in the Melanesia division of the Australasian festoon, and, excluding Australia, from which it is separated by Torres Strait, the largest island in the world. Physically it lies wholly within the tropics, and is traversed by enormous mountain masses, except in the south-westernmost area, which is generally low and swampy. Politically the island is partitioned between the Dutch and the British Empire, everything west of the 141st meridian of longitude (about 150,000 sq. miles) belonging to the former, the eastern portion being in British possession. The south-eastern division is known as Papua (q.v.), and the north-eastern division (Kaiser Wilhelm Land) now comprises the 'mainland' of the territory of New Guinea, for which Australia is mandatory power. The Dutch colony formed part of the residency of Ternate (Moluccas), but was created a province in 1920, and is neither greatly developed nor exhaustively explored, although several mountains and the lower courses of rivers have been named and mapped. Much of the hinterland is covered with dense primeval forests. Rice, maize, yams, and sugar-cane are raised by the natives (Melanesians). Area of the island (estimated), 300,000 sq. miles (greatest length, 1490 miles; greatest breadth, 430 miles).

The island was sighted by Abreus in A.D. 1511; was visited by the Portuguese Don Jorge de Menesis (1526) and by the Spaniard Alvaro de Saavedra (1528); and in 1606 Torres, on his way to the Philippines, sailed through the strait that now bears his name. In 1793 New Guinea was annexed by two commanders in the service of the East India Company, and the three colonizing powers (British Empire, Germany, Netherlands) agreed to partition, each having suzerainty over islands adjoining its own territory. In Sept., 1914 (European War) German New Guinea was seized and occupied by Australian troops. The territory is now administered by Australia under mandate from the League of Nations dated 17th Dec., 1920.—Cf. E. V. Hesse-Wartegg, *Samoa, Bismarckarchipel und Neu Guinea.*

New Guinea, Territory of, that portion of the German New Guinea Protectorate which lay south of the equator (excepting only the Island of Nauru, q.v.), and which was known in German times as the 'Old Protectorate'. The principal islands (with their German names) and their approximate areas are:

	Sq. Miles.
Mainland of New Guinea[1]	70,110
Bismarck Archipelago—	
New Britain (Neu Pommern)	9,200
New Ireland (Neu Mecklenburg) ..	5,000
New Hanover (Neu Hannover).. ..	380
Admiralty Islands	1,000[2]
Solomon Islands—	
Bougainville..	3,500
Buka	200

The mainland of New Guinea is the northern section of Eastern New Guinea, and was formerly known as Kaiser Wilhelm Land. Mountain ranges sweep down to the coast, leaving only a narrow but very fertile strip near sea-level. The hinterland is rugged and mountainous, with heights reaching to over 11,000 feet, and as all trade and communication are by sea along the coast, the interior is left almost wholly to the native population and is little known. There is about 750 miles of coast-line, fringed with coral reefs, but there are no deep inlets. In Astrolabe Bay are some sheltered harbours, including Konstantinhafen, Friedrich Wilhelm Hafen, and Alexishafen, the best on the coast. Of the many rivers the most important are the Sepik (Kaiserin Augusta) and the Ramu (or Ottilien). The Bismarck Archipelago and the Solomons are in general mountainous, and flat only near their coasts. Some of the Duke of York and Admiralty Islands are low lying. Bougainville and Buka are very rugged. In all these islands the streams are rapid and unnavigable. Among harbours are Blanche Bay (New Britain), Mioko (Duke of York Island), Nares Harbour (Admiralty Island), and Queen Carola Harbour (Buka Island).

Climate, &c.—Throughout the territory, except in the mountains, the climate is hot and moist all the year round. The mean temperature on the mainland is 80° F., with high humidity. There is no cool season, and rain falls in all months, the (coast) average rainfall being between 100 and 150 inches. In the Bismarck Archipelago there is a comparatively dry season from May to September. The islands are outside the typhoon area. Dysentery is prevalent among the natives, with some Tokelau ringworm and elephantiasis; malaria, dysentery, and blackwater fever exact a heavy toll among the whites. Apart from disease, the climate is enervating for Europeans.

Production.—Maize, rice, arrowroot, taro, coconut and oil palm, rubber (ficus, hevea, and kastilloa), cotton, sisal hemp, cocoa, coffee, lemon, and citronella grass. Some birds of Paradise and feathers are exported.

Inhabitants, &c.—The natives of the mainland are mainly mixed Papuans and Melanesians, split up into many tribes. The islanders are chiefly Melanesians, the Admiralty Islanders showing a Papuan and perhaps Polynesian admixture; in the extreme west of the archipelago they have Malay and Chinese affinities. Many languages are used, but bêche-de-mer is the *lingua franca* of the territory. The approximate population of the territory (enumerated and estimated) is 230,000, exclusive of the unexplored mainland, but including 1185 Chinese, 87 Japanese, and 160 Malays and Javanese (1921).—BIBLIOGRAPHY: *German Foreign Possessions in the Pacific (Foreign Office Handbook); Official Year-Book of the Commonwealth of Australia, No. 14* (1901–20); H. Schnee (editor), *Deutsches Kolonial Lexikon.*

New Hampshire, a state in the New England division of the United States, with a short coast-line on the Atlantic. It is mountainous in the north-central portion and is generally interspersed with mountain, lake, and stream. The state capital is Concord (pop. 1920, 22,157); the largest city is Manchester (pop. 1920, 78,384). Railways are owned or operated by the Boston & Maine system, excepting a Canadian National (Grand Trunk) line in the north. There were 1253 miles of steam track in 1917 and (1919) 246 miles of electric railway. 63 per cent of the total population are Roman Catholics, and about one-fifth are foreign-born, being mainly Swedes, Russians, Irish, and Canadians. Agriculture is important, hay, corn, potatoes (1,950,000 bushels, 1920), and oats being produced. Fruit-growing is extensive; sheep-raising for wool-production (202,000 lb., 1919) and cattle-breeding are progressive. Mineral deposits are undeveloped, some granite, mica, mineral-waters, and scythe-stones being produced. Manufactures are mainly confined to the southern region of the state, and include boots and shoes, and cotton and woollen goods. Education is compulsory between the ages of eight and fourteen years, extensile to sixteen years if the elementary grades are not completed. Roman Catholic parochial schools are maintained in all cities, and in several of the larger towns; elsewhere religious instruction is not given. The principal non-sectarian colleges are Dartmouth College at Hanover (founded 1769) and the New Hampshire College of Agriculture and Mechanics at Durham (founded 1868). State area, 9341 sq. miles (310 sq. miles are water); pop. (1920), 443,083.

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[1] According to the *Foreign Office Handbook* the total area of the 'Old Protectorate' is 91,810 sq. miles. The Report of the Royal Commission on German New Guinea gives the following areas: New Britain, about 10,000 sq. miles; New Ireland, 4600 sq. miles; Bougainville, 3500 sq. miles; New Hanover, over 500 sq. miles. The *Deutsches Kolonial Lexikon* gives the area of New Britain as 13,100 sq. miles, and the total area of the Bismarck Archipelago as 18,100 sq. miles.

[2] From *Deutsches Kolonial Lexikon.*

New Hampshire was the first of the original thirteen states of the Union. The state is divided into ten counties. Modern Government comprises a Governor and a Legislature composed of a Senate (24 members, elected for two years) and a House of Representatives (from 300 to 409 members, according to population, to which representation is proportional). Two Senators and two Representatives are sent to Congress.—Bibliography: J. G. Palfrey, *History of New England*; J. N. M'Clintock, *History of New Hampshire.*

New Hanover, an island in the Australian territory of New Guinea, administered by the Commonwealth under mandate of the League of Nations dated 17th Dec., 1920. It was formerly Neu Hannover, of the German Bismarck Archipelago, and was occupied by the British in 1914. It is mountainous and heavily timbered, and produces coco-nuts, rubber, coffee, and cotton. The natives are of Melanesian extraction; the *lingua franca* of the coast is bêche-de-mer ('pidgin English'). Area (Commonwealth estimate), 380 sq. miles; (Foreign Office estimate) over 500 sq. miles; pop. 6539.

New Haven, the principal city and seaport of Connecticut, United States, the county seat of New Haven county, on New Haven Bay; served by the New York, New Haven, & Hartford Railway. The city is widely known as the seat of Yale University, which was transferred from Saybrook in 1716. It is a great transport city, and has an enormous coastal trade. Munitions, iron- and steel-ware, hardware and cutlery, canned meats, and rubber goods are manufactured. New Haven became a city in 1784. From 1701 to 1703 it was joint capital of the state. Pop. (1920), 162,520.

Newhaven, a seaport of Sussex, England, on the Ouse; served by the London, Brighton, & South Coast Railway. It is the starting-point of the Newhaven-Dieppe cross-Channel service, and has a good coastal trade and some shipbuilding. All civilian steamboat services were suspended during the European War, when Newhaven became a base for the delivery of war material. Pop. (1921), 6436.—*Newhaven* is also the name of a fishing-port of Midlothian, Scotland, on the Firth of Forth; now included in Edinburgh, and served by the Caledonian Railway.

New Hebrides, a volcanic island chain of Oceania, in the Australasian festoon, comprising the main islands of Erromanga, Tanna, Espiritu Santo, Mallicolo, Epi, Efate or Sandwich, Futuna or Erronan, and Aneityúm. They are under joint Anglo-French administration. Coco-nuts (for copra), maize, millet, coffee, cotton, sandal-wood, cocoa, and bananas are produced, and kauri pine is exported from Aneityúm. Trade is chiefly with Sydney and New Caledonia (Nouméa). Importation or distillation of spirits is prohibited. The natives are of Melanesian origin. Quiros discovered the islands (1606), but Captain Cook revisited and named them in 1774. Area, 5100 sq. miles; pop. about 70,000, including 200 British and 400 French.—Bibliography: *Convention between the United Kingdom and France concerning the New Hebrides* (London, 1907); G. Bourge, *Les Nouvelles Hébrides, 1606–1906.*

New Ireland, an island in the Australian territory of New Guinea, administered by the Commonwealth under mandate of the League of Nations dated 17th Dec., 1920. It was formerly New Mecklenburg, second in size and importance of the German Bismarck Archipelago, and was occupied by the British in 1914. A range of mountains traverses the island. Kaewieng has a good harbour (Nusa) and is the chief town (European pop. 100); Namatanai (European pop. 40) is the only other town. Coco-nut plantations occupy (1918) 34,796 acres. The natives are of Melanesian extraction; the *lingua franca* of the coast is bêche-de-mer ('pidgin English'). Area, between 4600 and 5000 sq. miles; pop. approximately 29,000 (26,486 enumerated; additional 2500 estimated).

New Jersey, a maritime state in the middle

Atlantic division of the United States. It is mainly a lowland region, comprising a vast coastal plain covering more than a half of the state area, and is traversed in the north-west by the Appalachians. The state capital is Trenton (pop. 1920, 119,289); other cities are Newark (414,216), Jersey City (297,864), Paterson (135,866), Camden (116,309), Elizabeth (95,682), Bayonne (76,754), Hoboken (68,166), and Passaic (63,824). In 1919, 2461 miles of steam and 1593 miles of electric railway track traversed the state. Practically all the great trunk lines and subsidiaries converging on New York from the south or west, or on Philadelphia from the south, must pass through New Jersey on account of its geographical position. There were 175 miles of canals in 1919. 51·5 per cent of the church-going inhabitants are Roman Catholics, and more than half of the total population are foreign-born, coming principally from Italy, Germany, and Ireland. Agriculture, horticulture, fruit-growing, forestry, and market-gardening are practised, maize (11,440,000 bushels in 1920) and hay (544,000 tons, 1920) being the principal agricultural products. Fruit and vegetables are canned in forty-four factories. Fisheries yield trout, perch, bass, black bass, &c., in lakes and streams; shad, menhaden, and sturgeon fisheries exist on the Delaware River and Bay and in the New Hampshire littoral. Mineral deposits include magnetic iron, talc, zinc, manganese and graphite, limestone and trap rock, sand, gravel, and clay. Mineral-waters, Portland cement, peat, and greensand marl (from which potash salts are made) are minor products. The principal manufactures are in oil-refining, high explosives, foundries and machinery, silk goods, wire and wire-cloth, and chemicals. Education is free and compulsory between the ages of seven and fifteen years. The non-sectarian universities include Princeton (founded 1746) and New Brunswick and Stevens Institute of Technology at Hoboken (founded 1871). State area, 8224 sq. miles (710 sq. miles are water); pop. (1915), 2,844,342 (including 95,281 coloured), (1920), 3,155,900.

New Jersey was one of thirteen original states of the Union. The state is divided into twenty-one counties for local government. The central authority comprises a Governor, Senate (21 members, elected by counties for three years, one-third seeking re-election annually), and a General Assembly (60 members, elected annually by counties on a basis proportional to population). Two Senators and twelve Representatives are sent to Congress.—BIBLIOGRAPHY: E. J. Fisher, *New Jersey as a Royal Province*; E. P. Tanner, *The Province of New Jersey*.

New Leon, a state of Mexico known as Nuevo Leon.

New London, a city and port of entry of Connecticut, United States, the county seat of New London county, on the Thames; served by the New York, New Haven, & Hartford Railway, and by steamers. It is a naval station, with construction and repair depots. Woollens, silks, and machinery are manufactured, and there are foundries and engine-works. New London was founded in 1646 as Nameaug, and became a city in 1784. Pop. (1920), 25,688.

Newman, Francis William, younger brother of Cardinal Newman, was born in London, 1805, died in 1897. He was educated at Ealing and at Worcester College, Oxford, graduating double first (1826). From 1826 to 1830 he was Fellow of Balliol, but resigned in consequence of his conscientious scruples about signing the Thirty-nine Articles. He was appointed classical tutor at Bristol College (1834), professor of classics at Manchester New College (1840), and professor of Latin at University College, London, 1846–63, from which time he gave himself to literature. His writings exhibit great scholarship and versatility. Among them are: *The Soul: its Sorrows and Aspirations* (1849); *Phases of Faith* (1850); and *Theism* (1858).

Newman, John Henry, Cardinal, born at London 1801, died in 1890. He was educated at Ealing and Trinity College, Oxford, where he graduated with third-class honours (1820), and was elected Fellow of Oriel College. He was vice-principal of St. Alban's Hall (1825–6) under Dr. (afterwards Archbishop) Whately, and was incumbent of St. Mary's, Oxford, and chaplain of Littlemore (1828–43). During this last period he took part with Keble and Pusey in originating the Oxford movement; was a leader in the propaganda of High Church doctrines, and contributed largely to the celebrated *Tracts for the Times*. The last of these, on the elasticity of the Thirty-nine Articles, was censured by the University authorities, and was followed by Newman's resignation of his livings (1843) and secession to the Church of Rome (1845). Ordained a priest of that Church, he was successively head of the Oratory of St. Philip Neri at Birmingham, rector of the Roman Catholic University of Dublin (1854–8), and principal of the Roman Catholic School at Edgbaston. In 1879 he was created a cardinal. He wrote some remarkable works sustaining the doctrines of the Church of Rome, particularly the *Apologia pro Vitâ suâ* (1864), and the *Reply to Mr. Gladstone* (1875) on the Vatican Decrees.—BIBLIOGRAPHY: R. H. Hutton, *Cardinal Newman* (English Leaders of Religion Series); W. Barry, *Newman*; W. Ward, *Life of John Henry, Cardinal Newman*; E. A. Abbott, *The Anglican Career of Cardinal Newman*.

Newmarket, a town of Cambridgeshire, England, on the Great Eastern Railway. It is the head-quarters of the Jockey Club and of English racing, and the race-course (Newmarket Heath) has ten courses, including one of 4 miles in length. Eight race-meetings are held annually, the chief races being the Two Thousand Guineas (April) and the Cesarewitch (October). Newmarket was made a racing-centre by James I and by Charles II. An ancient trench known as the Devil's Dyke traverses the Heath. Pop. (1921), 9753.

New Mexico, a state in the mountain division of the United States, on the Mexican frontier, traversed by the Rio Grande del Norte and by parallel mountain ranges (Truchas, 13,156 feet; Baldy, 12,660 feet; Costello, 12,635 feet) running roughly north and south. Generally it is one enormous, sloping plateau cut up in the north by the Rockies. To the east of the state is the plateau Llano Estacado. The state capital is Santa Fé (pop. 1920, 7236); other towns are Albuquerque (1920, 15,157), Raton (5544), and Roswell (7236). 2974 miles of steam (1917) and 11 miles of electric railway track traverse the state, through which run two transcontinental lines (Atchison, Topeka, & Santa Fé—Chicago to San Francisco; and the Southern Pacific—New Orleans to San Francisco) and their ramifications; the northern districts are served also by a branch of the Denver & Rio Grande system. Indian Reserves have an area of 6278 sq. miles, and a pop. (1919) of 20,581, mainly of the Apache, Navaho, and Pueblo tribes. The population includes a large number of Mexicans (Spanish-Americans), Austrians, Italians, and Germans. Roman Catholicism is the predominant faith. Maize (7,155,000 bushels, 1920), wheat (6,375,000 bushels, 1920), and potatoes are produced by the help of an irrigation scheme which embraces 750,000 acres. Horses, cattle, sheep, and pigs are largely raised; the wool clip yielded 15,076,000 lb. of wool in 1919. 8,381,768 acres of afforested land are State-owned, and another 4,000,000 acres are under private control (1917). Mineral resources are valuable, granite, sandstone, limestone, marble, gold, silver, copper, lead, zinc, turquoise, and gypsum and mica in small quantities being produced. Manufactures are mainly allied to forestry and agriculture, but there is a large railway rolling-stock repair and construction industry. Education is free and compulsory between the ages of six and sixteen years, and the use of English is enforced. Religious instruction in schools is prohibited, except in schools specially provided for that purpose and conducted outside of normal school hours. There are twenty-six Indian schools maintained by the Federal Government, and three normal schools. The principal colleges are that of agriculture and mechanics (founded 1890), a school of mines at Socorro (founded 1895), a military institute, and the University of New Mexico at Albuquerque (founded 1891).

New Mexico was for long in association with Mexico proper, but after the Mexican War (11th May, 1846, to 2nd Feb., 1848) New Mexico passed to the United States. The territorial boundaries included part of Texas, all Utah, a part of Colorado, and all Arizona, but the region was subsequently disrupted, and in Nov., 1911, New Mexico was admitted to the Union as a state. The state is divided into twenty-nine counties. The modern Government consists of a Governor and a Legislature, comprising a Senate (24 members) and a House of Representatives (49 members). Two Senators and one Representative are sent to Congress.—Cf. M. Frost and A. F. Walker, *The Land of Sunshine.*

Newnham College, an English college for the higher education of women at Cambridge, founded in 1871, and incorporated in 1880. Women are not admitted under eighteen years of age, and the course of study corresponds with that of Cambridge University, the members of the college being expected to prepare for a Tripos examination at the end of their third year.

New Orleans, the largest city and commercial capital of Louisiana, United States, on the Mississippi; served by the Louisville & Nashville, Southern Pacific, Illinois Central, Texas & Pacific, and seven other railway systems. It is built on an alluvial flat, and is saved from inundation by *levees* or embankments built along the city front and along the river. The city covers an area of 200 sq. miles. Public buildings are architecturally uninteresting excepting the cathedral of St. Louis (1794) and the archbishop's palace (1737). The city is called the 'Crescent City' from its form as a crescent on a bend of the river. Sugar-refining is an important industry; machinery, cotton goods, shoes, cigars, and furniture are produced. New Orleans is second only to Liverpool as the foremost cotton-port of the world; it is an outlet for the produce of the southern country drained by the Mississippi, such as sugar, molasses, rice, tobacco, maize, wheat, oats, and flour, in addition to the main export, cotton. On account of the wetness of the surrounding country the dead are not buried at New Orleans, and corpses (except Jewish) are stored in tiers within large vaults, at a height of 12 feet above the ground. Tulane University (law, arts and sciences, medicine, and technology), universities for coloured students, the Orleans University, and the Jesuit College (1847) are of educational importance. Pop. (1920), 387,220.

New Orleans was founded by the Sieur de Bienville (1718), and is named in honour of the duc d'Orleans, then Regent of France. It was long the administrative centre of French Louisiana, was ceded to Spain (1763), returned to

France (1800), and was bought by the United States (1803). It became a city in 1813, and was unsuccessfully attacked by the British in 1815.

New Plymouth, a town of North Island, New Zealand; capital of the Taranaki district. It is in a dairying and stock-raising district, and exports butter, cheese, and bacon. Pop. 10,000.

Newport, a town in and the capital of the Isle of Wight, on the Medina, and the headquarters of the insular railway system. The principal building is the church of St. Thomas (1854–6). Near by are the ruins of Carisbrooke Castle. Newport replaced Carisbrooke as capital of the island. Pop. (1921), 11,036.

Newport, a seaport-town of Monmouthshire, England, on the Usk; served mainly by the Great Western and London & North Western Railways. It has a large shipping trade in coal and iron, and has manufactures in steelwork, nails, glass, pottery, railway plant, boilers, and chemicals. There is some shipbuilding. A transporter bridge crosses the Usk. Newport is an outlet of the South Wales coal-field. Pop. (1921), 92,369.

Newport, a city and port of entry of Rhode Island, United States, the county seat of Newport County, on Narragansett Bay; served by the New York, New Haven, & Hartford Railway. It is a former state capital, and is a summer-resort. Newport became a city in 1853. Pop. (1920), 30,255.

Newport News, a city and port of entry of Warwick county, Virginia, United States, on Hampton Roads, at the mouth of James River; served by the Chesapeake & Ohio Railway and by steamers. It has an enormous sea-going and coasting trade, and some shipbuilding and manufactures. Settled in 1620, it was incorporated in 1896. Pop. (1920), 35,596.

New Providence, an island of the Bahamas (q.v.), British West Indies. Nassau, the capital, is also capital of the Bahamas. Pop. about 13,600.

New Red Sandstone, the lowest group of Mesozoic rocks in Britain, lying between the Permian below and the Lias above. The term has sometimes been used to include the Permian. See *Trias*.

New Ross, a river-port of County Wexford, Ireland, on the Barrow; served by the Dublin & South Eastern Railway. Rosbercon, on the other side of the river, is included in New Ross urban district, but was formerly a separate borough. Old Ross is a village about 8 miles distant. Pop. 5800.

Newry, a seaport of County Down, Ireland, on the Newry Water; served by the Great Northern Railway, by electric railway, and by a line to Greenore. The river is canalized to afford an access to Newry Harbour by sea-going vessels. There are large flax-spinning mills; milling, distilling, tanning, brewing, and the manufacture of bricks, &c., are staple industries. Agricultural produce is exported. Newry is an ancient town, and is mentioned in the *Annals* of 1162: " the monastery . . . of Newry was burnt and also the yew tree which St. Patrick himself had planted ". The name is derived from *Iubhar-cinn-tragha* (the Yew at the head of the Strand), which, shortened to *Iubhar*, was eventually corrupted to Newry. Pop. 12,000.

New Siberia, the collective name for three uninhabited island-groups of the Arctic Ocean, viz. Anjou, Liakhov, and De Long, which are nominally administered by the Russian government of Yakutsk. They contain a wealth of fossilized mammoth bones. Area, about 10,000 sq. miles.

New South Wales, the oldest state of the Commonwealth of Australia. An outstanding orographical feature is the various mountain ranges of the Australian Cordillera or Divide, which, under various names, traverse the coastal area from north to south, the culminating point being Mount Kosciusko (7308 feet). Towards the west the highlands descend to the Great Plains, which is drained by the Darling, Murrumbidgee, and Murray, originally independent rivers discharging separately into a sea that once occupied the basin of the Lower Murray. The emergence of the land has engrafted these three rivers to one trunk, the Lower Murray, on the western borders of New South Wales. The 255,000 sq. miles of the Great Plains, beside the Darling, the Murray, and the Lower Murray, give no contribution to the river except that which may arise from springs in their beds. On the east the rivers are short and powerful. New South Wales has a coast-line of 700 miles (or 443 sq. miles of territory to 1 mile of coastline), extending between Point Danger (north) and Cape Howe (south). The main waters of the Murray form the southern boundary-line. State area, exclusive of Federal capital territory (Canberra and Jervis Bay), 309,432 sq. miles; pop. (1921), 2,101,384, of which 1,070,520 were males.

Towns.—Sydney (pop. 1921, 899,099, or 42·89 per cent of the state population) is the capital; other towns and their populations (1919) are: Newcastle (62,900), Broken Hill (22,950), Parramatta (12,630), East and West Maitland (12,400), and Granville (12,030).

Communications.—The State railways are mainly of 4-foot-8½-inch gauge, and (1919–20) 5877 miles were open for traffic.

There is no uniformity in gauge throughout Australia, each state having different standards, and varied standards prevailing in each state, e.g. New South Wales has an additional 45 miles of 5-foot-3-inch gauge, 79 to 80 miles of 3-foot-6-inch gauge, and 36¼ miles of 5-foot-0-inch gauge. There are only 16·82 miles of railway to each 1000 sq. miles of New South Wales territory.

Government and Private Railways

Mileage open (1858–1920)

	Miles.		Miles.
1855	14.	1910–1	4,027.
1861	73.	1914–5	4,439.
1871	358.	1915–6	4,491½.
1881	1,040.	1916–7	4,781½.
1890–1	2,263.	1917–8	5,025.
1900–1	2,926.	1918–9	5,170.

Tramways are Government property, and are controlled by the Railway Commissioners. Steam-tramways operate at Newcastle, Broken Hill, Parramatta, between East and West Maitland, and from Sutherland to Cronulla. Other systems are mainly electric. The standard Government gauge is 4 feet 8½ inches. See *Sydney.*

Social Conditions.—The aboriginal population of New South Wales was never large, and the number now stands at 1501 (1921), of which 879 are males. Immigrant races consist mainly of the three divisions of the United Kingdom and their descendants. Non-Europeans comprise half-caste aboriginals and Asiatics (10,983), with some Africans, Polynesians, and Americans, the whole comprising 10·72 per 1000 of total population.

About 83 per cent of the population are Australian born, 13 per cent of the remainder being natives of the United Kingdom, and 0·72 per cent natives of New Zealand, that is, about 96 to 97 per cent of the total population are either Australasian or belong to the United Kingdom.

The population of New South Wales, as is general throughout Australia, are transplanted Britons, with all the essential characteristics of their British forbears, the desire for freedom from restraint being perhaps somewhat accentuated through the greater opportunity for open-air existence and the absence of the restrictions of older civilizations. The principal religions are: the Church of England, with an overwhelming majority; the next in importance being Roman Catholic, Presbyterian, and Methodist. Religion and State are separate; the Church of England is under the guidance of the Archbishop of Sydney, who is Metropolitan of New South Wales and Primate of Australia and Tasmania; a Roman Catholic Archbishop of Sydney controls the bishops of the eight State dioceses.

Education.—Education is free and compulsory between the ages of seven and fourteen years, and is under State control. Arrangement is made for the teaching of Japanese in selected high schools, of which there are twenty-three in the state. There is a State school of aviation at Richmond. A college of practical agriculture (Hurlstone, near Sydney) prepares students for the Hawkesbury Agricultural College. The University of Sydney is the largest and best-equipped in the Commonwealth; the Technical College and Technological Museum is also located at Sydney, and there are other technical colleges at Maitland, Newcastle, Bathurst, Broken Hill, Albury, and Goulburn. State school children are medically inspected once every three years.

Commerce, &c.—The principal exports are gold, silver, copper, lead, tin, coal, wool, metal manufactures, wool tops, butter, wheat, flour, fruit, jam, timber, meat (frozen and tinned), rabbits, hides and skins, leather, tallow, pearl-shell, and coco-nut oil. New South Wales produces about seven-eighths of Australian coal, and is the mining state of the Commonwealth. Iron, gold, silver and lead, copper, tin, wolfram, zinc, and shale are worked. Agriculturally New South Wales is wealthy, and is the principal sheep-rearing and wool-producing state (about 305,613,000 lb. of wool as in the grease in 1918–9, and 296,641,000 lb. in 1919–20). Cattle, horses, and pigs are also raised; oranges, lemons, mandarines, and other citron fruit are grown; wheat, maize, barley, oats, potatoes, and tobacco are cultivated. There is some vine-growing, and a considerable industry in dried raisins and currants, as well as in table grapes and wines. Sugar-cane is cultivated. An extensive irrigation and artesian boring scheme anticipates the conservation of the water-supply on the Murray drainage system of the Great Plains. State forests, under the administration of a Commission, cover an area of 5,085,050 acres; sawmills have an annual output estimated at £1,277,082. Among manufactures are those of butter and cheese, brewing, tobacco, ore-smelting, jam and fruit packing, and bacon- and ham-curing. There is one sugar-refinery; three sugar-mills (1919–20) have an annual output of raw sugar and molasses valued at £238,414.

History.—New South Wales was discovered by Captain Cook in 1770, and founded as a penal settlement (at Botany Bay) in 1788. One of its early Governors was the notorious Captain Bligh, who was deposed by the colonists in 1808. The most important events in its history since convict immigration ceased in 1840 are the establishment of representative institutions in 1843; the erection of Victoria into a separate colony in 1850; the important discovery in May, 1851, of extensive auriferous tracts, with a consequent increase in population and prosperity. The first railway, from Sydney to Parramatta, was opened in 1855. An international exhibition was held at Sydney in 1879. The Intercolonial Conference held at Sydney in 1883 was the first practical step towards the federation of the colonies, which was finally effected by the Australian Commonwealth Act passed through the Imperial Parliament in 1900. On 1st Jan., 1901, New South Wales joined the federated ' colonies ' as a state of the Australian Commonwealth. The state is subdivided into 141 counties.

Modern Government.—Legislative power is vested in a Parliament comprising a Legislative Council (of not less than 21 members, appointed by the Crown for life) and an elected Legislative Assembly (90 members). Executive power is in the hands of a Governor appointed by the Imperial Government.—Bibliography: *Official Year Book of New South Wales* (annual); J. W. Edgeworth, *New South Wales: Historical, Physiographical, and Economic.*

Newspapers. The origin of the newspaper is lost in antiquity. The *Acta Diurna*, a daily record of events, issued in ancient Rome, was certainly a kind of newspaper; the *Peking News* has had a continuous existence since the sixth century. The invention of printing of course made the newspaper, as we know it, possible, but it is unknown exactly where the first printed news-sheet made its appearance. It was somewhere on the Continent in the sixteenth century. Prague makes a claim to the production of the first newspaper, the *Noviny* (News), in the Czech language, during the Turkish wars. English newspapers came later than those of the Continent. There were printed pamphlets and manuscript news-letters before the Civil War in the seventeenth century, and *The Oxford Gazette*, afterwards *The London Gazette*, began in 1665. The printing-press, however, laboured under great difficulties. No manuscript could be set up in type without the licence of the Archbishop of Canterbury or the Bishop of London. Milton, in *Areopagitica*, pleaded eloquently in 1644 for the liberty of printing, but the Licensing Act was not abolished until 1695.

The first daily was *The Daily Courant* of 1702, and two years later Defoe, the real father of English journalism, started the *Review*. Progress was necessarily slow until all restrictions were removed. These were the stamp duties, 4*d.* on each copy at first, imposed in 1712 and not removed until 1855; the advertisement duty of 3*s.* 6*d.*, removed in 1853; and the paper duty, which came to an end in 1861. Steam was applied to printing by *The Times* in 1814; the telegraph was later pressed into service, and with the introduction of compulsory education in 1870 the demand of the reading public grew to enormous dimensions and was everywhere met. The last half of the nineteenth century witnessed an amazing expansion of the daily press, with extraordinary developments of organization. By the end of the century the linotype was in fairly general use. This is a type-setting machine, superseding the old, laborious method of hand-composition, which, however, is still retained for some of the tabular matter. The linotype has the great advantage of abolishing the dreary work of redistributing the type after use. The 'lines of type' cast by the linotype need no redistribution; they are merely so much metal that is melted down again. Printing-machinery has been so perfected that, printing from huge rolls of paper miles in length, they can turn out from 50,000 to 100,000, and even more, copies of a newspaper per hour, printed on both sides, cut, and folded. The whole system of printing has been revolutionized. A modern newspaper is not printed direct from the type. The latter is assembled in the page *forme*, and a matrix (mould) taken on paper, which is baked and then placed, in semicircular shape, in a machine into which molten metal is poured. A semicircular plate of stereotype is the result, and is fixed on to the cylinders of the huge printing-press, rendering phenomenally rapid printing possible. A newspaper printing-machine will print from six rolls of paper simultaneously, and use up about a hundred miles of paper daily. The complete papers emerge so rapidly that it is almost impossible for the eye to distinguish them; they seem like an endless 'fall' of finished papers.

Speed has become the basic factor of the newspaper. News is transmitted from the correspondents by telegraph in skeleton form, by telephone, by wireless, and even by pigeons; is handled with skill and swiftness by reporters and sub-editors (who correct, condense or exexpand, explain, provide headlines, &c.), using recognized contractions to save every possible minute; and, finally, the printed papers are distributed by motor-cars, motor-cycles, special trains, and even by aeroplanes, so that London morning papers are on sale within a couple of hours or so in Paris. All this apparent rush necessitates organization tuned up to the highest pitch. No industry is more highly organized than the daily newspaper, which, as is obvious, is a machine in perpetual motion, working, as to some parts of it, all the twenty-four hours of the day, and, especially where a Sunday paper is attached, all the seven days of the week without cessation. Each newspaper office is equipped with an elaborate reference library, where biographies and other information are pigeon-holed ready for immediate consultation, to enable any item to be explained, expanded, or verified. Considering the well-nigh frantic speed with which everything has to be done—for a single minute's delay may mean the missing of a train and the consequent spoiling of a whole edition—mistakes are surprisingly few. A trivial error, such as the omission of a comma, the use of the word 'defendant' for 'plaintiff', or the misspelling of a name, may involve a paper in a libel action costing hundreds of pounds.

With the enormous multiplication of morning, evening, and weekly papers competition has become keen. Leading morning papers before the European War had come down to the price of a halfpenny. Prize competitions, insurances, and other ' stunts ' were introduced to increase circulation and attract advertisers as well as readers. In addition to news, every possible magazine feature was introduced; papers appeal now not only to the politician, the business man, the sport lover, and the reader of sensation, but to women and even to children. Literature, the arts, science, industry, inventions, entertainment, and fashion have their regular columns. Pictures and photographs are features of all papers; by the use of the ' fudge ' box, an invention of Mr. Mark Smith, of Manchester, the latest news is put into the stop-press space after the stereo plates are on the machine. On the occasions of important events the papers are sent in advance to local centres, and the special item stamped with a metal or rubber stamp in the space. Electrophones are fitted in a hall so that a speech may be heard in the office and taken down there to save the time of transmission. Exploring expeditions are organized and financed; Stanley's search for Livingstone was so exploited by the London *Daily Telegraph* and the New York *Herald.* The London *Daily Mail* prize of £10,000 for an aerial flight from London to Manchester marked a red-letter day in the new means of transport as well as in journalism. Leading provincial papers are connected with London by private telegraph wires and telephones, so that they can quote the Metropolitan papers and give their racing-tips hours before the London papers can reach their centres. *The Daily Mail* has an establishment in Manchester where its northern edition is produced. Special telegraph instruments enable the news to be wired from London to Manchester in a few seconds. *The Daily News* for several years had a similar edition. Pneumatic tubes have been laid down between post and newspaper offices to save precious minutes in transmission of telegrams and cables. No expense is spared to increase speed and ensure efficiency. Every new device is tried.

So elaborate has the organization become that the smaller papers are being pushed out, and the principal newspapers are in the hands of multi-proprietors and big syndicates, each controlling several papers in London and the provinces. Expense is thus minimized by concentration and duplication. An article or story will appear simultaneously in several papers in different localities. Coincident with this development, newspapers are no longer content to reflect public opinion; they seek to guide it and even to dictate. A proprietor will advocate a special policy in his papers, and by intensive propaganda promote the interests of a political party, or carry on what appears to be a feud against another. He will even advocate a special food or garment. These manifestations have led to considerable criticism, even in the profession of journalism, inasmuch as they tend to the reduction of journalists to the position of hacks.—BIBLIOGRAPHY: J. Grant, *The Newspaper Press: its Origin, Progress, and Present Position*; J. D. Symon, *The Press and its Story*; A. Baker, *The Newspaper World*; G. B. Dibblee, *The Newspaper*; J. E. Rogers, *The American Newspaper*; L. E. Hatin, *Histoire politique et littéraire de la presse en France*; Lord Northcliffe, *Newspapers and their Millionaires.*

Newt, or **Eft,** the popular name applied to various genera of amphibians included in the ord. Urodela (' tailed ') of that class. Water-newts, or ' water-salamanders ' as they are sometimes termed, possess a compressed tail, adapted for swimming. These forms are oviparous, and though aquatic in their habits they are yet strict air-breathers. The larval gills are cast off on maturity being reached, or about the third month of existence. The larval tail is retained throughout life. The male animals are distinguished by the possession of a crest or fleshy ridge borne on the back. The food consists chiefly of aquatic insects, larvæ, &c. The great water-newt (*Triton cristātus*) is about 6 inches in length; the spotted newt (*T. vulgaris*) averages about 3 inches; and both are common in freshwater pools and ponds in Britain.

Water Newts (*Triton cristātus*)

Newton, Sir Isaac, English mathematician and natural philosopher, the foremost scientist of this if not of any country, was born at Woolsthorpe, Lincolnshire, in 1642, and died at Kensington in 1727. He was educated at Grantham Grammar School and Trinity College, Cambridge, where he commenced residence in 1661. In

1664 he was elected scholar, and in 1667 Fellow of his college. In 1665, at the time of the plague, Newton went to stay at Woolsthorpe, and, if a favourite story may be believed, it was the fall of an apple in the garden there which gave the first start to the train of thought which ultimately led him to the discovery of the law of gravitation. The hypothesis that the moon is held in its orbit by the same force of attraction to the earth as causes the fall of the apple, and that the intensity of this force diminishes inversely as the square of the distance from the centre of attraction, can easily be tested arithmetically, and Newton actually made the calculation, with a result, however, which was adverse to the theory, owing, as it turned out, to the erroneous value accepted at that time for the length of the earth's radius. In 1670, with the better value for the radius which had been obtained by Picard, the moon calculation came out quite satisfactorily, and by 1684 Newton had worked out a great part of the theory in its application to the motions of the planets and their satellites. His great work on dynamics and astronomy, *Philosophiæ Naturalis Principia Mathematica*, usually referred to simply as the *Principia*, was composed in the years 1685 and 1686. The appearance of its pages is in strong contrast to that of modern treatises on the subject, Newton casting his demonstrations into purely geometrical form where a writer of the present day would invariably use the calculus. Newton succeeded Isaac Barrow (q.v.) as Lucasian professor of mathematics in 1669, and was elected a Fellow of the Royal Society in 1671. In 1689 he was elected to Parliament as one of the members for the University of Cambridge. In 1694 he was appointed to the Wardenship of the Mint, and in 1697 to the Mastership. In 1708 he became president of the Royal Society, and was re-elected annually during the remainder of his life.

Newton's discoveries in pure mathematics and in optics are almost as celebrated as those he made in astronomical theory and in dynamics. In optics his great achievement was the discovery of the relation between colour and refrangibility, and his investigations on the prismatic spectrum are classical (see *Light*; *Refraction*; *Spectrum*). He invented a reflecting telescope, and investigated the theory of the colours of thin films (Newton's rings). He had difficulties about accepting a wave theory of light, and gave dynamical explanations of reflection and refraction on the basis of the corpuscular theory.

In mathematics we have Newton to thank for many methods and results. The *Binomial Theorem* (see *Maclaurin's Theorem*), *Newton's Interpolation Formula* (see *Differences, Finite*), and *Newton's Triangle*, the last a method of fundamental utility for expanding an implicit algebraic function, are a few of the subjects associated with his name, but it is as the inventor of the method of *fluxions* (q.v.), the direct and immediate forerunner of the modern infinitesimal calculus, that he has made the deepest mark on the history of mathematics. His controversy with Leibnitz as to which of them was the first discoverer of the principle of the calculus was settled entirely in Newton's favour; some competent people, indeed, who had considered the evidence, were inclined to the view that Leibnitz really stole the original idea from Newton. Opinion now gives Leibnitz rather more credit as at least a partially independent discoverer; and as a historical fact the immensely superior notation introduced by Leibnitz must be given a large share of the credit for the rapid development of mathematical science on the Continent during the eighteenth century, at a time when slavish adherence to Newton's methods of expression was paralysing English mathematics (see *Maclaurin, Colin*). See *Dynamics*; *Kinetics*; *Newton's Laws of Motion*; *Kepler's Laws*; *Gravitation*; *Gravity*; *Interference*. Apart from the *Principia*, the chief works of Newton which were published in separate form are: *Optics*, *Tractatus de Quadratura Curvarum*, and *Enumeratio Linearum Tertii Ordinis*. An important paper is that entitled *Analysis per Equationes Numero Terminorum Infinitas*. A complete collection of Newton's works was published in 1779–85 by Dr. S. Horsley.—BIBLIOGRAPHY: Sir D. Brewster, *Memoirs of the Life, Writings, and Discoveries of Sir Isaac Newton*; W. W. R. Ball, *A Short History of Mathematics*.

Newton, a city of Massachusetts, United States, in Middlesex county; served by the Boston & Albany Railway. There are woollen, cord, and other manufactures. Newton was settled in 1631, and became a city in 1873. It was formerly called Cambridge, the name being changed in 1692.

Newton Abbot, a town and railway junction of Devonshire, England, at the head of the Teign estuary; served by the Great Western Railway. There are railway workshops, and pottery is made. The tower of the church of St. Leonard's is interesting, and on a pedestal before it William of Orange was proclaimed king (1688). Pop. (1921), 13,837.

Newton-in-Makerfield, or **Newton-le-Willows**, a town of Lancashire, England, served by and a junction on the London & North-Western Railway. There are paper- and glass-works, railway workshops, and iron-foundries. Pop. (1921), 18,776.

Newton's Laws of Motion. These laws form the basis of the science of dynamics (q.v.). The ancients, while acquainted with the principles of statics, made little or no progress in kinetics. Their astronomers (Hipparchus, Ptolemy, and others) studied deeply and successfully the motions of the heavenly bodies, but left untouched the problem of accounting for those motions by the action of forces. The kinetics of terrestrial bodies was also beyond the scope of the science of the ancients. Not till the time of Galileo Galilei (1564–1642) was a correct foundation laid for the modern science of kinetics. Galileo established by experiment and observation the laws of falling bodies, which contradicted the dictum of Aristotle that the velocities of bodies are proportional to their weights. By his famous experiment of dropping bodies of various weights from the top of the leaning tower of Pisa, he showed that (allowing for the effects of air resistance) all bodies tend to fall at the same rate. Again, while the ancients looked upon motion in a circle ('the perfect motion') as the fundamental type, Galileo propounded as the first law of motion, "that a body left to itself would move uniformly in a straight line". From the time of Galileo to that of Newton advances in kinetic science were made by several natural philosophers, and specially by C. Huygens, who gave the kinetic theory of the pendulum. In the introductory part of the *Philosophiæ Naturalis Principia Mathematica*, which may be described as a treatise on dynamics with applications to astronomy, Sir Isaac Newton gave in his three Laws of Motion a statement of the fundamental principles of dynamics (q.v.), such as were (he says) already generally accepted by mathematicians, and amply confirmed by experiment and observation.

The logical completeness of Newton's account of the theory, as well as the experimental evidence for it, has given rise to much discussion. (See the treatise of Mach, which gives a very comprehensive survey of the historical development of dynamical theory up till about 1880.) It has been pointed out that the definitions of *mass*, *motion*, *force*, *time-measurement*, and *absolute rest* are so interconnected that the fundamental postulates are not made clear, and certainly not explicitly stated. The phrase 'uniform rectilinear motion', for example, has no meaning unless we have a *frame of reference*, for positions, and a means of defining equal intervals of time. Newton's view as to absolute rest and motion may be indicated by this quotation: "The effects by which absolute motion is distinguished from relative are the centrifugal forces of rotation. For merely relative rotation these forces are zero; in true rotation they exist in a greater or less degree." Then follows the well-known experiment of the rotating bucket of water, which shows the effects of centrifugal force, though the water may be at rest relatively to the bucket. It is easy to show that if two bodies, or rigid frames, have relative to each other a uniform motion of pure translation, then *both*, or *neither*, would satisfy the condition that all other motions relative to it as base could be accounted for by forces obeying the third law, so that absolute rest is undefinable on Newton's own principles. The recent theory of relativity (q.v.) opens up a new point of view for the whole subject. See *Kinetics*. —BIBLIOGRAPHY: E. Mach, *The Science of Mechanics*; J. Clerk Maxwell, *Matter and Motion*; P. G. Tait, *The Laws of Motion*.

Newton Stewart, a town and police burgh of Scotland, in Wigtownshire (one suburb in Kirkcudbrightshire), on the Cree; served by the Portpatrick & Wigtownshire Joint Railway. Pop. (1921), 1831.

Newtown (W. *Drefnewydd*), a town of Montgomeryshire, North Wales, on the Severn; served by the Cambrian Railway and the Montgomeryshire Canal. It is the chief seat of Welsh flannel manufacture. Pop. (Newton and Llanllwachaiarn, 1921), 5670.

Newtownards, a town of County Down, Ireland, near the head of Strangford Lough; served by the Belfast & County Down Railway. The chief industries are flax-spinning and linen and muslin manufacturing. Pop. 12,000.

New Ulm, a city of Minnesota, United States, the county seat of Brown county, on the Minnesota; served by the Minneapolis & St. Louis and the Chicago & North-Western Railways. There are grain-elevators and manufactures of cigars, machine tools, shirts, bricks, and flour. Settled in 1854, New Ulm was incorporated in 1876. Pop. about 6900.

New Westminster, a town of British Columbia, Canada, on the Fraser River; served by the Canadian Pacific and local railways. Salmon-canning and sawmilling are the main industries. New Westminster was founded in 1858, and was formerly capital of the mainland. Pop. 13,000.

New Year's Day, the first day of the year, from the earliest times observed with religious ceremonies or festive rejoicing. New Year's Day, being the eighth day after Christmas, is the festival of Christ's circumcision. The day is a holiday, celebrated with religious service all over the European continent, though not generally in Britain nor in the United States. The Anglo-Saxon year used to begin on 25th Dec., but at the Conquest it was changed to 1st Jan. Later England, however, like all Christian countries, began the year with the 25th of March. With the introduction of the Gregorian Calendar (in 1582) the 1st of January was restored in the majority of Christian countries as New Year's Day, but in England only in 1751. In Scotland the new year began on 1st Jan. from 1599.

New York, a state in the Middle Atlantic division of the United States, the thirtieth in area but the first in wealth and population, and called, therefore, the 'empire state'. It has a considerable seaboard on the Atlantic, mainly on Long Island, and has coast-lines of 75 miles on Lake Erie and of 200 miles on Lake Ontario, by which, with the St. Lawrence River, it is bounded from east to north. In the north-east rise the well-timbered Adirondack Mountains (Mount Marcy, 5377 feet); the Catskills (Slide Mountain, 4205 feet), also densely wooded, traverse the east-central regions. There are large State forest-reserves in both areas. The region extending from the Adirondacks to Pennsylvania (in the south) is a flat, well-watered, temperate plateau. Albany (pop. 1920, 113,344) is the state capital, but New York (q.v.) is by far the most important city; others are Buffalo (pop. 506,508), Rochester (pop. 295,750), Syracuse (pop. 171,717), Utica (pop. 94,156), and Yonkers (pop. 100,224), and there are about fourteen other towns of over 30,000 inhabitants. Indian Reserves have an area (1918) of 137 sq. miles; pop. 6342. New York State had (1917) 8534 miles of railway track and (1919) 6039 miles of single-track electric railway, the principal railways being the Long Island (on Long Island); Lehigh Valley; Erie; New York, Central, & Hudson River (operating also the West Shore Railway); Delaware, Lackawanna, & Western; Pennsylvania; Mohawk & Hudson; and the Delaware & Hudson systems. State commercial canals include the Erie Canal (361 miles—Lake Erie to Lake Champlain), the Oswego Canal (Lake Erie to Lake Ontario), and the State Barge Canal (790 miles—New York City to Buffalo). About a quarter of the population is foreign-born, and includes chiefly German, Irish, English and Scots, Italian, Russian, Austrian, Canadian-English and -French, French, and Swiss elements. The state, of great manufacturing importance, has also an extensive agricultural industry, maize (32,595,000 bushels, 1920), wheat (10,998,000 bushels, 1920), oats (44,275,000 bushels), roots and hay, tobacco (2400 acres, yielding 3,072,000 lb.), and sugar-beet being the principal crops. Dairying is progressive, and sheep-farming is extensive (1919, 4,022,000 lb. of wool). Mining and quarrying yield iron, talc, crude petroleum (808,843 barrels, 1918), natural gas, granite, trap-rock, sandstone, marble, limestone, and salt. Infusorial earth, garnet, emery, and crystalline quartz are also produced. Manufactures and exports are widely varied (see *New York City*). In 1919 there were 2082 newspapers, of which 203 were dailies and 969 weeklies, 1874 being published in English, 28 in Spanish, 24 in Italian, and 22 each in German and Yiddish. Other representative and important languages are Hungarian, Polish, French, Bohemian, Arabic, Greek, Portuguese, Swedish, Lithuanian, Chinese, Croatian, Finnish, Serbian, Albanian, Hebrew, Judæo-Spanish, Welsh, Persian, and Ukrainian. Education is compulsory between the ages of seven and sixteen; physical training is compulsory; and military training between the ages of sixteen and nineteen for pupils of colleges and public or private schools is rigorously enforced. There are 136 universities and professional schools, including Columbia University (founded 1754) and Cornell University at Ithaca (founded 1857); three are devoted entirely to women; the University of Rochester (1846) has students of both sexes, and the others are exclusively devoted to men. Area, 49,204 sq. miles (1550 sq. miles water; technically an additional 3140 sq. miles of water on Lakes Ontario and Erie are within the state); pop. (1920), 10,384,829.

New York was one of the original thirteen states of the Union, which she joined in 1788. For local government purposes there are 62 counties. The modern Government consists of a Governor and a Legislative, comprising a Senate (51 members, sitting for two years) and an Assembly (150 members, elected annually). Two Senators and 43 Representatives are sent to Congress.—BIBLIOGRAPHY: H. A. Stebbins, *A Political History of the State of New York, 1865–1869*; E. H. Roberts, *The Planting and Growth of the Empire State*; D. C. Sowers, *The Financial History of the New York State from 1789 to 1912.*

New York City, the metropolis of the American continent, the principal seaport, and the second largest city in the world, situated at the confluence of the Hudson and East Rivers, and on New York Bay, an extensive natural harbour. The bay is divided into an outer harbour (Lower Bay), separated from the Atlantic by Sandy Hook Bar, and an inner harbour (Upper Bay), in which stands the Bartholdi Statue of Liberty (on Bedloe's or Liberty Island). In the bay are several islands, including Ellis Island, the United States immigration station. The chief portion of the city is situated on Manhattan Island, 13½ miles long and generally about 1¾ miles broad, and separated by the narrow channel of Harlem River from the mainland; while on the opposite shores of the East River are Brooklyn and Long Island City, and on those of the Hudson, Jersey City, Hoboken, &c. Since Jan., 1898, Brooklyn, Long Island City, Staten Island, &c., have been incorporated in New York.

Street Plan.—The plan upon which the newer portion of the city is laid out consists of parallel *avenues* (seven to the mile) named numerically, and running from south to north. Avenues are intersected at right angles by *streets* (twenty to the mile), also numerically named, and running from east to west. Fifth Avenue (7 miles long, 100 feet wide) is the great central avenue, and all the streets running east from it have the prefix *east*, and those running west the prefix *west*, and the houses are numbered accordingly. Fifth Avenue was the fashionable and aristocratic street, but has become more and more devoted to business, although many of the older families still reside there, particularly the millionaires, whose mansions overlook the Central Park. The main business district centres round Broadway, with the Metropolitan Opera House (intimately associated with Enrico Caruso), the enormous department stores, and the theatres. Madison Avenue, next east of Fifth Avenue, is a street of costly private houses and beautiful churches. Central Park extends between 59th and 110th Street and between Fifth and Eighth Avenue. More than a dozen other small public parks and squares are scattered over the city, the finest of the latter being Union Square on the east side of Broadway, and Madison Square on the east side of Fifth Avenue.

Buildings and Institutions.—The circumstance that the city is hemmed in by water, the high price of ground, and the improvement in the construction of elevators or lifts, early stimulated an upward instead of a lateral expansion in building construction, and accounts for the now famous 'sky-line', broken by sky-scrapers, many of which rear massive towers to a height of well over 300 feet. Among these are the Woolworth Building (55 stories, 750 feet), the highest structure ever built, excepting only the Eiffel Tower; the Singer building (612 feet); Metropolitan Life Assurance Company (693 feet); Commercial Cable (317 feet); and the *New York Times* Building (363 feet) at 42nd Street and Broadway. The buildings most worthy of notice, in an architectural aspect, are the Sub-Treasury; the City Hall, attractively set in the centre of an ornamental park; the post office, at the south end of City Hall Park; the Academy of Design; and Columbia University. The churches of all denominations number about 500, and include St. Patrick's (R.C.) Cathedral, built of white marble in the decorated style of the thirteenth century, and the Collegiate Church, dating from 1628. The principal religious faith is the Dutch Reformed. New York is generously provided with hospitals, asylums, and institutions of all kinds. The most important seat of learning in the city is Columbia University, founded by charter of George II in 1754. New York University was founded in 1831. There are also a number of medical schools and theological colleges and seminaries, besides the Cooper Union. New York is the terminal station of the three great trunk lines of the New York Central; the New York, New Haven, & Hartford (both Grand Central Terminal); and the Pennsylvania Railway systems.

Trade, &c.—New York is primarily a commercial city and a centre of distribution of domestic and foreign products, but it is also the centre of a vast manufacturing interest. The industries, however, are more of a varied character than individually important, the chief being connected with clothing, meat-packing, printing and publishing, and brewing. The water-supply is partly furnished from Croton Lake, an artificial reservoir supplied by Croton River, from which the water is conveyed by an aqueduct of stone masonry of a capacity of 115,000,000 gallons per day a distance of 40 miles to New York. A further enlargement brings water from the Askokan Reservoir (86 miles).

By the Act of 1897, under which Greater New York was constituted, the whole city is under a mayor, elected for four years, who appoints heads of departments; a president of the council, elected for four years also, who acts as deputy-mayor; and a council and board of aldermen. Each of the five constituent boroughs, Manhattan, Bronx (mainland), Queens (Long Island), Brooklyn (Long Island), and Richmond (Staten Island), has its own president and borough board.

History.—New York Bay and the Hudson River were first visited by Verrazano (1524), followed in 1609 by Henry Hudson. It was first settled three years after on the southern extremity. The Dutch settlement of Nieuw Amsterdam (founded 1621) had 1000 inhabitants in 1648. In 1664 it surrendered to the British, and took its new name from the Duke of York (afterwards James II). New York was taken from the Americans by the British at the beginning of the War of Independence (26th Aug., 1776), and held as the British head-quarters till its close (evacuated 25th Nov., 1783). From 1785 to 1790 it was the seat of the Federal Government, and at New York Washington was inaugurated to the presidency in 1789. During the war of 1812–5 its foreign commerce was almost annihilated. The first regular line of packet ships to Liverpool was started in 1817. The opening of the Erie Canal in 1825 gave a great stimulus to internal commerce. Since that date the progress of New York has been wonderful. Pop. in 1830, 202,589; in 1850, 515,547; in 1870, 942,292; in 1880, 1,206,600; in 1890, 1,518,501; in 1910 (as extended), 4,766,883; on 1st Jan., 1920:

Manhattan	2,284.103
Bronx	732,016
Brooklyn	2,018,356
Queens	469,042
Richmond	116,531
Total New York	5,620,048

Bibliography: Mrs. S. van Rensselaer, *His-*

tory of the City of New York (2 vols.); R. R. Wilson, *New York, Old and New*; Theodore Roosevelt, *New York*.

New Zealand, Dominion of, an archipelago in the South Pacific Ocean, about 1200 miles east of Australia, comprising two large islands, called North and South (or Middle) Island respectively, and a third of much smaller area called Stewart Island; length of the group, north to south, measured on a line curving nearly through their centres, about 1200 miles; area, 103,581 sq. miles, excluding islands annexed in 1901. The Dominion is slightly smaller in size than the United Kingdom, of which it lies very nearly at the antipodes. There is a coast-line of 3000 miles. There are nine provincial districts, four in North Island (Auckland, Taranaki, Wellington, and Hawke's Bay) and five in South Island (Nelson, Marlborough, Canterbury, Otago, and Westland). These districts are subdivided into seventy-seven counties.

Physiography.—The islands are long and narrow, and occur on a ridge which separates the Southern Pacific on the east from the Southern Ocean on the west. The three islands are connected by a submarine ridge, no part of which is more than 100 fathoms deep, while the line marking the 500 fathoms has a long extension to the north-west, and in that direction the New Zealand ridge is connected with Melanesia and Queensland by a platform never more than 2000 fathoms deep. Across this formerly continuous land New Zealand received most of its present animals and plants by migration.

The geographical backbone of New Zealand consists of a system of fold mountains running south-west to north-east nearly the whole length of South Island, and continued in North Island up to East Cape. The chief volcanic mountains are found in the Taupo volcanic area —wide plains of lava and volcanic ash. The hollows in those plains are filled by lakes, such as Lakes Taupo and Rotorua. Above these plains lie many hills formed by volcanoes, including Ruapehu (9175 feet), Ngauruhoe (7515 feet), and Tongariro (6485 feet). The other chief volcanic mountains occur along the coasts and on the edges of foundered areas. Such is Mount Egmont, rising as a snow-capped cone from the coast of Taranaki (8250 feet). The chief rivers of New Zealand rise in the Southern Alps. On the west rivers are short and powerful; on the east the distance to the sea is longer, and rivers flow across the wide Canterbury Plains. Lakes of the North Island occur in basins on the Volcanic Plains, such as Lake Taupo, drained by the Waikato, New Zealand's longest river. The Cold Lakes of the South Island lie in deep fiord-like valleys, the floors of which sink below the level of the sea; thus Lake Manapouri, 597 feet above sea-level (at the surface), is 1462 feet deep.

Climate.—The climate is typical of a maritime country, the influence of the adjacent seas rendering it uniformly equable and healthy. In North Island the climate is of the Mediterranean type with winter rains; in South Island the climate is similar to but much warmer than that of England. The rainfall on the west coast of South Island ranges from 100 to 200 inches per annum.

Social Conditions : Aborigines.—The original natives of New Zealand, called Maoris, a people of Polynesian origin, are supposed to have emigrated from the Navigators' or the Sandwich Islands some centuries ago. The Treaty of Waitangi was signed on 6th Feb., 1840, at the Bay of Islands, and New Zealand became a British colony through the cession to Queen Victoria by the Maori chiefs, of their rights as rulers in return for Queen Victoria's personal assurance of protection and recognition of their rights as British subjects. With few exceptions the Maoris have kept the treaty in letter and in spirit, and the New Zealand administration has always planned and legislated for the protection of the aboriginal population against exploitation by land-dealers and speculators, and towards their firm establishment upon the soil. The unravelling of a tangled skein of 'land titles' was rendered even more complicated by the Maori laws of succession, which vest interest in a dead man's property in all his family and relatives equally, irrespective of the degree of relationship, presumably upon the reasoning that all are descended from a common ancestor. This 'common ancestor' generally gained his title to the property by eating the former owner.

Religion.—There is no State religion. The Anglican Church has six dioceses; an archbishop resident at Wellington assisted by an archbishop coadjutor and three bishops control Roman Catholic affairs. The Anglican faith has an overwhelming majority (42·90 per cent), and Presbyterianism follows (24·36 per cent), with Roman Catholics (14·17 per cent), and Methodists (9·91 per cent) in addition. Other faiths are insignificant.

Education. — Elementary education is free, secular, and compulsory. Secondary education is provided for in numerous high-schools, grammar-schools, colleges, &c. At the head of the higher education is the University of New Zealand, an examining body empowered to grant honours, degrees, and scholarships. Affiliated to it are Otago University, at Dunedin, Canterbury College (Christchurch), Auckland University College, and Victoria College (Wellington). There are also many special schools, native schools, &c.

Towns.—Wellington, on Cook Strait is the capital of the Dominion (pop. 1921, 88,876, or

including the entire metropolitan area, 107,428); other towns are Christchurch (1921, 67,292), Auckland (1921, 81,718), Dunedin (1921, 59,198), Wanganui (1921, 16,492), Palmerston North (1921, 15,648), and Invercargill (1921, 15,204).

Communications.—In 1920 there were 3134 miles of Government railways. All the principal towns have tramway systems.

Production.—The chief economic product of New Zealand is and always has been its wool, supplemented by frozen meat and dairy produce. In North Island the conditions for dairy farming are exceptionally good, owing to the almost perpetual natural feed and the extraordinary mild climate. About two-thirds of the total land surface is suitable for agriculture; wheat, oats, and barley being the principal products.

Forests.—About 17,000,000 acres are afforested.

Minerals.—Gold, tungsten, silver, and coal are found.

Manufactures.—Meat-preserving, &c.; butter and cheese; ham- and bacon-curing; grain-milling; soap and candles; wood and timber; engineering; printing and bookbinding; motors and cycles; tanning, &c.; boots and shoes; clothing, &c. The largest output is in meat, butter and cheese, leather, printing and books, and grain-milling.

Imports and Exports.—There is a large trade with India and Burma, and with Ceylon; rice, coffee, tea in bulk, hessian, jute bagging and sacking, corn-bags, &c., being imported from the former, and desiccated coco-nut, cocoa-beans (uncrushed), tea in bulk, fibres and yarns (coir, jute, hemp, and flax) coming from the latter. Other trade is chiefly with the United Kingdom, Australia, Canada, United States, and Japan.

Area and Population.—Area (total Dominion), 103,581 sq. miles; pop. (1920), 1,178,722 (exclusive of Maoris, 49,776 in 1916, and Cook Islanders, 12,797 in 1916). The preliminary count of the census of 17th April, 1921, shows a pop. of 1,218,270.

History.—New Zealand was first discovered by Tasman in 1642, but little was known of it till it was circumnavigated by Cook in 1769 and 1774. The first permanent settlement was made by missionaries in 1815, but no regular authority was established by the British Government till 1833, when a resident was appointed, with limited powers, and subordinate to the Government of New South Wales. In 1840 New Zealand was erected into a colony; in 1841 it was formally separated from New South Wales and placed under its own independent governor; and in 1852 it received a constitution and responsible government. Troubles with the natives of the North Island about land have given rise to frequent Maori wars, and so late as 1886 a disturbance about land arose. In 1865 the seat of government was removed from Auckland to Wellington. In 1873 the Public Works Policy was inaugurated, and large loans were raised for immigration, harbours, railways, roads, &c. In 1876 the colony was divided into counties. Commercial depression prevailed from 1880 to 1890. Much recent legislation has been in favour of the working man, for promoting land and ex-soldier settlement, &c. The colony became a 'Dominion' in 1907. Consequent on the European War a period of trade depression was experienced in 1921–2.

Dependencies.—Auckland Islands, Chatham Islands, Kermadec Islands, and the Cook and other South Pacific Islands (annexed to New Zealand in June, 1901).

See *North Island*; *South Island*; *Stewart Island.*

Bibliography: *New Zealand Official Year Book: Report on Commercial Conditions in the Dominion of New Zealand* (1921) (H.M. Stationery Office Publication); G. W. Russell, *New Zealand To-Day*; John White, *Ancient History of the Maori*; G. H. Scholefield, *New Zealand in Evolution, Industrial, Economic and Political.*

New Zealand Spinage (*Tetragonia expansa*), a succulent trailing plant inhabiting New Zealand, Tasmania, Australia, South America, and Japan, ord. Ficoideæ. It has been introduced into Europe and North America as a substitute for spinage.

Ney (nā), Michel, Duke of Elchingen, Prince of the Moskwa, Marshal and Peer of France, born in 1769 at Sarre-Louis, executed 7th Dec., 1815. He entered the military service in 1788, rose to the rank of general of division in 1798, and as such distinguished himself in the Rhine campaign. Appointed marshal of the empire by Napoleon in 1805, he achieved victory over the Austrians at Elchingen, and took part in the battle of Jena. During the Russian campaign he commanded the 3rd Division at the battle of the Moskwa, and conducted the rear-guard in the disastrous retreat. When Napoleon abdicated and the Bourbon dynasty was established, Ney took the oath of allegiance to the king and received a command; but when the emperor landed from Elba, his old general joined him at Lyons and opened the way to Paris. In the campaign which followed it was Ney who led the attack on the British centre at Waterloo, and after five horses had been killed under him he only retired from the field at nightfall. When the Allies entered Paris, he escaped in disguise to the provinces, but was finally arrested, brought back to Paris, tried for treason, and condemned to death.—Cf. H. Welschinger, *Le Maréchal Ney.*

Ngami, a South African lake, in the Bechuanaland Protectorate. During the rainy season the water is fresh, but in the dry season it becomes brackish. Ngami was first visited by Livingstone and Oswell in 1849.

Nganhwei, or **Anhui**, an inland province of China, west of the maritime province of Kiang-Su, drained by the Yang-tse and Hoai-ho. It is level country, excepting in the south and west-central districts, and tea (Keemun) is extensively produced. North of the Yang-tse lies the most prolific rice-producing belt of all China. The capital is Anch'ing. Area of province, 54,810 sq. miles; pop. (variously estimated), 14,075,000 to 36,000,000.

Niag′ara, a river of North America, separating Ontario from the state of New York, and conveying the waters of Lake Erie into Lake Ontario. It is 33½ miles long, and varies in breadth from 1 to 4 miles, being about the former where it issues from Lake Erie, near the city of Buffalo. It is occasionally interspersed with low wooded islands, the largest of which, Grand Island, has an area of 17,000 acres. The total descent in the river's course between the two lakes is 331 feet. About 15 miles from Lake Erie a sudden narrowing and descent in the channel causes what are called the Rapids, below which the river, here divided by Goat Island, is precipitated over the celebrated falls. The rush of the river is such that the water is shot a clear 40 yards from the cliff, leaving a narrow pathway for a short distance below for the adventurous. The cataract on the south side of the island, called the American Fall, is 162 feet high, width 1125 feet; that on the Canadian side, called the Great or Horse-shoe Fall, is 149 feet high, width 2100 feet. Below the falls the river rushes with great velocity down the sloping bottom of a narrow chasm for a distance of 7 miles. About 3 miles below the falls a sudden turn in the channel causes the water to whirl in a vast circular basin before renewing its journey. Logs and other floating material sometimes continue whirling here for many days. About a furlong below the falls is a steel arch bridge (main span 840 feet) for an electric tramway and other traffic; lower down are a cantilever bridge and a steel arch bridge carrying railway lines. Special areas are reserved as public parks on both sides. The falls now supply a great amount of water-power, and electricity is generated on a great scale and transmitted to Buffalo and other distant places. On the American side is the city of Niagara Falls (pop. 50,760).

Niam-Niam (properly **A-Zandeh**), a negroid people in Central Africa, on the watershed north of the Welle (Uele) River, South-Eastern Sudan. The name Niam-Niam is a Dinka word for great eaters. The Niam-Niam are a hunting people, and are of a compact and powerful build, with long nose, small mouth, broad lips, and reddish-brown or copper-coloured skin. Apparently at a comparatively recent period they wandered from the west to their present habitation, and made themselves masters of the country. They have a well-founded reputation for cannibalism.

Nias, a Dutch island in the Malay Archipelago, lying west of Sumatra. The people are of Malay extraction. Rice, sugar, and pepper are grown extensively. Area, 1800 sq. miles; pop. estimated at 200,000.

Nibelungenlied (nē′bė-lụng-ėn-lēt; ‘Lay of the Nibelungen’), German epic written in the Middle High German dialect, and dating from about the twelfth century. It is divided into thirty-nine sections, contains some 6000 lines, and is constructed in four-lined rhymed stanzas. The tale, briefly told, is this: Kriemhild lives with her brother Gunther, King of Burgundy, at Worms. To his court comes Siegfried, son of Siegemund, King of the Netherlands. This Siegfried is possessed of the Nibelungen gold hoard, a magic sword, a cloak of darkness, besides great strength and courage. Thus equipped he comes to the court and wins the love of Kriemhild. In gratitude for his success Siegfried undertakes to assist Gunther, the brother of his bride, in his efforts to win the hand of Brunhild, an Icelandic princess. Together they sail for the far north, and there Gunther succeeds, with the help of Siegfried's cloak of darkness, in winning the three test games of skill which the lady played with him. Still on the bridal night the princess mocked at Gunther her husband, wrestled with him, bound him, and hung him up scornfully against the wall. But the next night Gunther, with the invisible help of his friend Siegfried, overcomes the bride, and the latter carries away her girdle and ring. Siegfried and his wife Kriemhild next appear on a visit to the Burgundian court at Worms, where Gunther the king now resides with his wife Brunhild. While there the two ladies quarrel, and in her rage Kriemhild taunts Brunhild with having had dealings with her husband Siegfried, and in proof thereof she produces the ring and girdle which he took from her chamber on the bridal night. Brunhild bitterly resents this calumny and meditates vengeance. This she accomplishes by the hand of Hagen, one of her husband's warriors, who slays Siegfried in his sleep. With rage and grief in her heart the widowed Kriemhild broods over the possibility of revenge. Thirteen years pass, and then Kriemhild marries Etzel, King of the Huns. Again thirteen years pass, and then at her instigation Etzel invites Gunther and Hagen with 10,000 warriors to visit the capital of the Huns. This they accept, and while they are seated at a great feast the Burgundians are all massacred by the Huns, with the exception of Gunther and Hagen. These two are delivered up to Kriemhild, who completes her vengeance by slaying them both, while she in her turn is killed by a Hunnish warrior who is enraged at her cruelty. This epic has been produced in modern German by Simrock, Bartsch, and Gerlach, and translated into English by Lettsom, Birch and Needler, while a resumé will be found in one of Carlyle's miscellanies.—Cf. F. E. Sandbach, *The Nibelungenlied and Gudrun in England and America.*

Nicæ'a (modern **Isnik**), an ancient city of Asia Minor, the capital of Bithynia, founded by Antigonus, and renowned as the seat of the second Œcumenical Council assembled by Constantine in A.D. 325. At this council the nucleus of the Nicene creed was promulgated. After the foundation of the Latin Empire in Constantinople (1204), Theodorus Lascaris made Nicæa the capital of his empire, but it gave place to Constantinople on the recovery of that city by the Greek emperors (1261), and fell finally to the Turks in 1333.

Nicarag'ua, a republic of Central America, between Honduras (north) and Costa Rica (south), having coast-lines on both the Atlantic (Caribbean Sea, 300 miles) and the Pacific (200 miles).

General.—Most of Northern Nicaragua is from 2000 to 3000 feet above sea-level, and on it rises a series of volcanoes, of which Consequina, on the Gulf of Fonseca, is famous for its tremendous eruption of 1835. There is a wide eastern coastal plain known as the Mosquito Coast (q.v.). The uplands of Nicaragua end to the south and south-west on the edge of a depression which begins on the Pacific side in the Gulf of Fonseca, and is continued by the valleys of Lakes Managua and Nicaragua and the Rio San Juan de Nicaragua to the Caribbean. This depression forms the lowest valley across America. The Cordillera de los Andes rises to the east of the depression and flanks the plateaux which slope gradually from the main Cordillera to the Caribbean. Among rivers are the Segovia, forming part of the Honduras-Nicaragua frontier, the Hueso, Rio Grande, Bluefield, and Rama, but the San Juan from Lake Nicaragua is the only one of any importance for navigation.

Towns.—Managua, on the southern shores of Lake Managua, is the capital and seat of government (pop. 1920, 60,342); other towns are Leon, a former capital (73,520); Granada (21,133); and Matagalpa (15,749). Corinto and S. Juan del Sur are the two seaports of Western Nicaragua, and through them pass 86 per cent of the exports and 64 per cent of the imports of the Republic.

Communications.—Roads are few and bad; the only railway (171 miles) is the Pacific Railroad of Nicaragua, from Corinto to Leon, Managua, Granada, and Diriamba (pop. 8000), with branches to El Viejo and Monotombo. This line is owned partly by the United States Government, who hold 49 per cent of the stock. Wireless stations are projected at Managua, Granada, San Carlos, San Juan del Norte, and Castillo.

Social Conditions.—The people of Western Nicaragua are of mixed Spanish-Indian extraction, with a proportion of full-blood in both classes. In the eastern half the inhabitants are mainly Mosquito and Lambo Indians, West Indian negroes, and Americans. Spanish is the principal language. Roman Catholicism is predominant, but all religions are tolerated, and none are State-aided. There is an archbishopric of Nicaragua with see at Managua, and three bishoprics of Leon, Granada, and Matagalpa, the Bishop of Matagalpa being coadjutor to the Archbishop at Managua. The monetary unit is nominally the gold *cordoba*; other coins are the silver *cordoba*, 10 cent, 5 cent (copper-nickel), 1 cent (copper-zinc), and ½ cent pieces, and paper *cordobas*. The metric system of weights and measures is in use.

Climate.—The altitude of Nicaragua ensures a fairly mild, healthy climate. In the tropical coastal belt there are wet seasons between May and November on the Pacific side, and from June to December on the Atlantic.

Production.—Farming, timber, and mining are the chief sources of wealth, and the republic is divided into two productive regions, east and west.

Agriculture.—Bananas, coco-nuts, plantains, oranges, pineapples, yucca, rice and wheat (Nueva Segovia district), tobacco (Masaya), coffee, sugar-cane, cacao, corn, beans, dairy-farming, butter and cheese.

Forestry.—Mahogany, cedar, dye-woods, and gums.

Minerals.—Gold, silver, copper, and precious stones.

Forests are infested with jaguar, puma, and ocelot. Alligators swim in lake and river; a kind of freshwater shark inhabits Lake Nicaragua; vultures, toucans, and humming-birds are abundant. Among snakes are the python, rattlesnake, and coral.

Education.—Elementary education is free and compulsory, but secondary education is not free and is not obligatory. There are three universities (Managua, Leon, and Granada) and a number of State normal schools. Military training and service is compulsory between the ages of seventeen and fifty-five years, but the period of active service is only a year.

Government.—The present Constitution of Nicaragua came into operation in April, 1913, and invests the executive power with a President appointed for four years. Legislative power is vested in a Congress, comprising 40 Deputies, elected by universal suffrage for four years (Lower House), and 13 Senators, elected for six years (Upper House). The President exercises his functions through a Council, comprising Ministers for Foreign Affairs and Public Instruction, Finance, Interior, Justice and Police, War and Marine, and Public Works. For local government the republic is divided into 13 departments and 2 comarcas, each under its own political and military administrator. Area of republic, 49,200 sq. miles; pop. (1918), about 750,000 (of which 75 per cent are located on the western side). See *Mosquito Territory*.—BIBLIOGRAPHY: F. Palmer, *Central America and its Problems*; S. J. Bernardo Portas, *Compendio de la historia de Nicaragua*.

Nicaragua, a lake of Nicaragua, Central America; length, 100 miles; breadth, 45 miles; depth, 15 to 250 feet; altitude, 118 feet. It discharges through the Rio San Juan to the Caribbean. At its north-western extremity it is connected by the Rio Penaloya with Lake Managua (length, 30 miles; area, about 600 sq. miles), whose waters it receives, and which once formed a part of Lake Nicaragua. On the Island of Ometepe (Lake Nicaragua) are the twin-peaks Ometepe (5643 feet) and Madera.

Nicaragua Canal, a proposed Nicaraguan ship-canal between the Caribbean and the Pacific Ocean, to start from Greytown, strike the San Juan at Ochoa, and to follow the river to Lake Nicaragua. Exit from the lake would be made below Ometepe Island, and the canal would open to the Pacific above Brito. The proposal was first mooted in 1849, but disputes with Great Britain, who then owned the proposed Caribbean entry (on the Mosquito Coast), hindered practical progress, and the Panamá route was decided upon by an International Congress at Paris in 1879. The United States own Great Corn Island (Mosquito Reef) and a naval base in the Gulf of Fonseca in virtue of a treaty signed by that country with Nicaragua (dated 18th Feb., 1916), by which, also, the canal route is alienated to the United States in return for a cash payment of 3,000,000 dollars.

Niccolite. See *Copper Nickel*.

Nice (nēs; It. *Nizza*; ancient **Nicæa**), a Riviera city and seaport of France, on the Baie des Anges, an arm of the Mediterranean, capital of the department of Alpes Maritimes. The original town was clustered round a hill near the shore, crowned by a strong castle. The new city lies to the west and north of this, on the right bank of the Paillon. Nice is much resorted to as a health-resort during winter. The climate is mild, the mean temperature being 60° F.; but the changes of wind are sudden, especially in spring. There is an annual carnival in April, and also an aviation meeting. Nice is the Greek Nicæa, founded by Phocæans from Marseilles in the fourth century B.C. It belonged to Sardinia from 1814 to 1860, when it was ceded to France. Both Garibaldi and Masséna were natives of the district. Pop. (1911), 142,940.

Nice, Councils of, ecclesiastical councils held at Nice or Nicæa, in Asia Minor, in A.D. 325 and 787. The object of the first Council of Nice, which was convened by Constantine, was to settle the controversies which had arisen in regard to the doctrine of the Trinity. The session lasted about two months. A creed was adopted by the council in its later form known as the Nicene Creed (q.v.). The council of 787 was summoned by the Empress Irene, with the concurrence of the Pope, and it decreed that images were to be used as aids to devotion.

Nicene Creed, a summary of Christian faith adopted by the Council of Nice against Arianism A.D. 325, altered and confirmed by the Council of Constantinople A.D. 381. Its characteristics are the insertion of the term "of one substance with the Father", directed against the Arian heresy; the insertion of the words "and the Son"; and the omission of the clause "He descended into Hell". It is recited both in the Roman Catholic and in the Anglican Church liturgies. The 'Filioque' clause, which stated that the Holy Ghost proceeded from the Father and the Son, was the chief cause of disagreement between the Eastern and the Western Churches.

Nichol (nik′ol), John, son of Professor John P. Nichol, born at Montrose 1833; educated at Glasgow and Oxford Universities. From 1861 to 1889 he was professor of English literature in Glasgow University. Besides his contributions to the *Encyclopædia Britannica* and the *Westminster* and *North British Reviews*, &c., he published the following: *Hannibal* (1872), a dramatic poem; *Tables of European Literature and History* (1876); *Tables of Ancient Literature and History* (1877); *English Composition* (1879); *Byron* (1880); *The Death of Themistocles and other Poems* (1881); *American Literature* (1882); *Kant* (1889); &c. He died in 1894.

Nichol, John Pringle, astronomer, born 1804 in Brechin, Forfarshire, died 1859. Licensed for the Scottish Church, he turned his attention to astronomy, and acquired so much reputation that in 1836 he was appointed professor of astronomy in Glasgow University. Among Dr. Nichol's literary works may be mentioned: *The Architecture of the Heavens* (1838), *Contemplations on the Solar System* (1838), *The Stellar Universe* (1848), and the *Planetary System* (1851). He likewise edited a *Cyclopædia of Physical Sciences*, published in 1857.

Nicholas, St., Bishop of Myra, in Lycia, is believed to have lived under Diocletian and Constantine, and to have suffered persecution under the former; but little is known of his life. His feast-day in the Roman calendar is

6th Dec.; he is the patron saint of poor maidens, sailors, travellers, merchants, and children (Santa Klaus), and is one of the most popular saints in the Greek Church.

Nicholas I (*Nikolai Pavlovitsh*), Tsar of Russia, third son of Paul I, born 1796, died 1855. He ascended the throne in 1825. He made war with Persia in 1827–8; joined in the Treaty of London, which secured the independence of Greece; and made one of the allied powers who destroyed the Turkish fleet at Navarino in 1827. This affair led to war between Russia and Turkey, in which the latter was defeated, paid indemnity, and signed the treaty of peace at Adrianople in 1829. Nicholas suppressed the Polish insurrection which broke out in the following year with relentless severity. In 1848 he assisted Austria with an army corps in putting down the rising in Hungary. Early in 1852 began the Russian effort to take over the holy places and assume the protectorate of the Christians in Palestine. This led to the Crimean War, and Nicholas is said to have boasted that he had two generals who would conquer the world—General January and General February. However, he fell a victim to his own officers, and died of a chill ere he reached the scene of operations.

Nicholas II, Tsar of Russia and the last of the Romanovs, was born on 6th May, 1868, the son of Alexander III by Maria Feodorovna. His early education was supervised by an English tutor, and his military training was undertaken by General Danilovitsh. Upon the death of his elder brother George, he automatically became Tsarevitsh, but neither his capabilities nor his education were such as to fit him for the assumption of supreme power in the vast empire of Holy Russia, to which he succeeded on 1st Nov., 1894. On 26th Nov., 1894, he married Princess Alix of Hesse, of German descent on her father's side, and of English descent on the side of her mother, Princess Alice the daughter of Queen Victoria; the empress embracing Orthodoxy, and assuming the title of Alexandra Feodorovna. She was undoubtedly the evil genius of the Russian Empire, and although she never betrayed imperial secrets to Germany, as has frequently been suggested, and was in fact a rabid anti-Hohenzollern, her hysterical nature and nervous temperament threw her into the arms of the false prophet Rasputin, who obtained a vast influence on the Tsarevitsh Alexis, and who sought to make and to depose ministers and counsellors, and actually became the hidden ruler of all Russia. On the outbreak of the European War the Tsar's disposition towards fatalistic mysticism, his apathy towards social reforms demanded by the progressive spirit of the times, and his feeble grasp upon foreign politics and the trend of home affairs, daily became more evident. Russia at this crisis demanded a firm and resolute leader for the working out of her political salvation, but unfortunately the Tsar Nicholas was weak. He offered little resistance to the Revolution of 1917, and in March, when he received a telegram at his army head-quarters outlining the state of affairs at Petrograd and demanding his abdication, he resigned the throne with composure to the Grand Duke Mikhail rather than expose the Tsarevitsh Alexis to the storm of revolutionary politics. The Grand Duke Mikhail refused to accept the Tsardom, and the emperor was transferred, a prisoner, from Tsarskoe Selo to Tobolsk in company with the empress, the Tsarevitsh, the beautiful Grand Duchess Tatiana, to whom rumour had already promised a place in the Royal House of Windsor, and her three sisters. In 1918 they were removed to Ekaterinburg by the Bolsheviki, and were jailed in a filthy three-roomed house under the guardianship of one Yurkovsky, a Jew inspired by all the fanaticism of a downtrodden race against the Romanovs, to whom he attributed the oppression which for many years indelibly stamped the peasant and the artisan of Imperial Russia. The advance of Koltchak caused the greatest anxiety to the Moscow Soviet, who anticipated a strong 'White' effort to release the imperial family. In July the Ekaterinburg Soviet placed their signatures to the order for the execution of the prisoners, and entrusted the task to Yurkovsky. On the night of 16th July, 1918, the imperial family were awakened, huddled into a cellar, and by torchlight the sentence was read; the royal family fell upon their knees in an attitude of prayer, and as the Tsar stepped forward with a gesture of appeal Yurkovsky fired and Nicholas fell. This was the signal for an indiscriminate butchery, and the dead bodies, after soaking in petroleum, were destroyed by fire.

Nicholas I, King of Montenegro, was born in 1841, educated at Paris and Trieste, and succeeded his uncle Danilo II in 1860. He belonged to the House of Petrovitsh-Njegosh, in which family the prince-bishopric had been hereditary since 1696, and was handed down from uncle to nephew. As a member of the 'Black Clergy' celibacy was an essential condition of the *vladika* or prince-bishop, but this was ignored by Danilo II, who married and declared his principality hereditary by direct descent in the male line. Nicholas I was the son of Mirko Petrovitsh, brother of Danilo II, and his father resigned all claims to the throne in his favour. As ruler he was an ardent reformer in matters civil, military, and educational, and (in 1878) he obtained from the Powers recognition of Montenegrin independence. In 1910 he assumed the title of king, much against the wishes of his subjects, and his unsuccessful wars entirely alienated the sympathy of Montenegro from the Royal House. During the European War Nicholas threw in his lot with the Allies, was forced to abandon his country, and was eventually deposed, Montenegro being merged in the Serb-Croat-Slovene Kingdom (Yugo-Slavia). Even before his deposition the aged monarch was sarcastically apostrophised as 'Nicholas the first and Petrovitsh the last'. He died at Antibes on 1st March, 1921, and is buried at San Remo. See *Montenegro.*

Nicholas (Nikolai Nikolaivitsh), Russian Grand-Duke, was born in 1856, the grandson of Tsar Nicholas I, and a first cousin of the Tsar Alexander III. He served in the Russo-Turkish War (1877), and subsequently was appointed to important cavalry commands, becoming Inspector-General of Russian Cavalry in 1895. In this capacity his skill as a soldier and his ability as an organizer were constantly demonstrated. He made a clean sweep of everything, good or bad, and brought the Russian cavalry up to a standard of efficiency that made it, as a body, one of the finest in the world. During the Revolution of 1905 he joined the newly created Council of National Defence, and was appointed to command the Imperial Guards and the St. Petersburg (Petrograd) military district. On the outbreak of the European War, the Grand-Duke Nicholas was hastily summoned to supreme command on the Eastern Front, and although handicapped by the deployment of the army before his arrival, and the co-operation of generals of whom he knew but little and who knew but little themselves, his strategy was the one factor that saved the Russian armies from a Waterloo or a Sedan in the retirement from the Narew-Vistula-San-Carpathians salient of 1915. His new positions were maintained throughout 1916 and 1917 by the Tsar, who assumed command in Aug., 1915, the Grand-Duke Nicholas becoming Governor-General and Commander-in-Chief in the Caucasus. Here, in co-operation with Yudenitsh, he achieved considerable success in advances against Trebizond and Erzerum, thus relieving, incidentally, the pressure on the British forces in the East. On the collapse of the empire (1917) he retired to the Crimea, but emigrated (1918) and went to Italy (1919).

Ni′cias, Athenian statesman and general, who displayed much skill and activity in the time of the Peloponnesian War. He was put to death after the ill-success of his expedition to Sicily (414 B.C.).

Nickel, a lustrous silver-white metal of great hardness, taking a very fine polish, magnetic, and when perfectly pure, malleable and ductile; symbol, Ni; atomic weight, 58·68. It can be rolled into sheets and drawn into wire, and melts at 1452° C. It is chiefly found in the United States, Canada (Sudbury district of Ontario), New Caledonia, and Germany. Nickel has become an object of considerable importance, and is extracted by several processes, including smelting, wet methods, and a process in which gaseous nickel carbonyl is produced, known as the Mond process. The salts of nickel are mostly of a grass-green colour, and the ammoniacal solution of its oxide is deep blue. Nickel mixed with brass in varying proportions is now well known and largely used as German silver or nickel silver. (See *German Silver.*) Another important use of the metal is for coating articles by the electro-plate process. (See *Electro-plating.*) Nickel is also largely used in the manufacture of special steels, such as nickel steel and nickel-chrome steel, which have properties very valuable for certain engineering purposes.

Nickel-glance, or **Gersdorffite**, a greyish-white, massive, and granular ore of nickel, on the average consisting of 35·5 nickel, 45·2 arsenic, and 19·3 sulphur, part of the nickel being sometimes replaced by iron or cobalt. In crystalline form it resembles pyrite.

Nickel-plating is the process by which a coating of nickel is placed upon another metal, and the essentials of the process, as in electro-plating, are a proper solution of the metal and a suitable electric current. See *Electro-plating.*

Nicobar Islands, a British archipelago of twelve inhabited and nine uninhabited islands in the Bay of Bengal, lying between Sumatra and the Andamans, and extending over a length of 163 miles. They are of volcanic origin. Area and population at the 1911 census were as follows:

	Population.	Area, Square Miles.	Density per Square Miles.
1. Car Nicobar	5794	49	118
2. Chowra	348	3	116
3. Teressa and Bompoka	692	38	18
4. Central group of four	1231	145	8·5
5. Southern group, Great and Little Nicobar, less Shompen[1]	272	170	1·6
6. Shompen (estimated)	375	222	1·7

The central group of four islands forms the magnificent natural harbour of Nancowry (q.v.). Coco-nuts are the staple commodity in which the Nicobarese have traded for upwards of 1500 years. The production is estimated at from 6 to 15 million nuts per annum, one-half coming from Car Nicobar. Much copra is made and exported. There is no money as such, the coco-nut being the standard of currency. The climate is tropical and generally unhealthy for Europeans. English and Hindustani are fairly well understood. The Nicobarese are as light-skinned as the Burmese, and are very intelligent, with a great facility for figures and a *penchant* for languages, and they present a curious example of semi-civilization of an effective type which has been evolved without undergoing much influence from more highly civilized races.

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[1] The Shompen is a race of primitive people who possibly represent the Nicobarese of a past epoch, and who at some time became shut off from the sea in Great Nicobar. They are still in a low state of civilization, and can neither make pottery nor work iron

The Nicobars are mentioned by writers from Ptolemy onwards, and there is a persistent legend of the natives having tails. The Danes and Austrians occupied the group, but it lay abandoned until the British formally took possession in 1869, and it is now under the Chief Commissioner of the Andamans and Nicobars. Two Agencies are maintained, one at Car Nicobar and the other at Camorta (Nancowry).—Cf. H. S. Montgomerie, *Nicobar Islands* (in the *Geographical Journal* for Jan., 1922).

Nicola'itans, a sect in the early Christian Church, mentioned in *Rev.* ii, 6. They are characterized as inclining to licentious and pagan practices, and their tenets and practices have been compared to the teaching of Balaam. The sect is supposed to have been founded by Nicolas, the proselyte of Antioch, one of the seven deacons, but this theory has been refuted.

Nicosi'a, a city of Sicily, in the province of Catania. It is the see of a bishop, and has a Norman cathedral. There are sulphur-springs and salt-mines in the neighbourhood. Pop. 16,000.

Nicosi'a, or **Lefkosi'a**, the capital of Cyprus, situated in the centre of the island. Its lofty walls and bastions still present an imposing appearance, and it has a number of mosques and Greek churches, and the residence of the High Commissioner. It has manufactures of silk, cotton, leather. Pop. 16,000.

Nic'otine, an alkaloid occurring in the tobacco plant, *Nicotiana Tabacum*. Tobacco contains from 1 to 8 per cent of nicotine in the form of salts of malic and citric acid, obtainable from an aqueous extract of the tobacco by heating with an alkali and steam-distilling. It is a colourless, hygroscopic, highly poisonous liquid with an unpleasant odour, and oxidizes in air, acquiring a brown colour. An impure nicotine extract is sometimes used as an insecticide.

Nictheroy, a city of Brazil, capital of the state of Rio de Janeiro, on the north shore of the Bay of Rio de Janeiro. Icaratry, a suburb, is a popular sea-bathing resort. Praia Grande is the commercial quarter. Flannels, tobacco, soaps, and spirits are manufactured. Pop. (1920), 86,726.

Nictitating Membrane, or '**Third Eyelid**', a thin membrane by which the process of winking is performed in certain animals, and which covers and protects the eyes from dust or from too much light. It is chiefly found in birds and fishes, and is represented in a rudimentary condition in man, and higher mammals generally, by the 'semi-lunar folds', situated at the inner or nasal angle of the eye.

Nidulariaceæ, a family of gastromycetous Fungi, the Bird's-nest Fungi, so called because their basidia are enclosed in groups in little egg-like cases (peridioles) contained in a cup-shaped common receptacle (peridium). Cyathus and Crucibulum are typical genera.

Niebuhr (nē'bör), Barthold Georg, historian, born at Copenhagen 1776, died at Bonn 1831. He studied law at Göttingen, and philosophy at the University of Kiel; became in 1796 private secretary to the Danish Minister of Finance, and soon after under-librarian in the royal library of Copenhagen. In 1798 he visited England and attended the University of Edinburgh for one session. Having been appointed historiographer-royal, he delivered lectures on Roman history in the University of Berlin, and in 1811 published them in two volumes. In 1816 he was appointed Prussian Minister to the Papal court at Rome, and there he resided until 1822, chiefly occupied in historical research. At the latter date he returned to Bonn and became adjunct professor of ancient history at the university. Here he continued his *Roman History*, the third volume of which appeared after his death. He also superintended the *Corpus Scriptorum Byzantinorum*, and published various archæological and philological treatises. His *Roman History* covered only the period down to the first Punic War, but introduced a new era in the study of Roman antiquity.

Niel (ni-el), Adolphe, French marshal, born 1802, died 1869. He was educated at the École Polytechnique, Paris, and the Military School, Metz; took part in the expedition against Constantine in Algeria; assisted as head of the staff of engineers at the siege of Rome in 1849 during the revolutionary movement under Garibaldi; commanded the engineers and planned the operations against Sebastopol in 1854–5; distinguished himself in the Italian campaign of 1859, and was thereafter made a marshal of France by Napoleon III.

Niemen, or **Memel**, a large river in Russia, Lithuania, and East Prussia. It rises in the government of Minsk, flows at first west past the town of Grodno, where it becomes navigable; then north; then again west, separating Kovno and Poland; and finally enters East Prussia, passes Tilsit, and falls into the Kurisches Haff. It is 640 miles in length, and is navigable as far as Grodno, 400 miles. The Niemen is of considerable commercial importance, and was a strategic point during the European War, the Russians having retreated to this river in 1914 and in 1915.

Nietzsche, Friedrich, German philosopher and poet, born at Röcken, near Lützen, in Prussian Saxony, 15th Oct., 1844, died insane at Weimar, 25th Aug., 1900. He was of remote Polish descent, he himself always emphasizing the fact that he was a noble Pole and not a German. The son of a pastor, he was educated at Naumburg and Pforta, and afterwards studied at the Universities of Bonn and Leipzig. Through the influence of his teacher Ritschl he was appointed professor of classical philology at Basel in 1869. Here he lectured for ten years, until he was compelled to resign his lectureship on account of ill-health. A pension granted him by the university, together with a small private income, enabled him to wander about Europe and to live in places most suitable for his health. He spent his time mostly in the Engadine and the Riviera. In Jan., 1889, at Turin, he became suddenly insane, and thus remained until his death. Nietzsche never elaborated a system of philosophy, although he intended to do so in his book *The Will to Power*, which remained fragmentary. Essentially a poet, he considered philosophy to be a constant criticism of life and thought. Divested of the paradoxical tone which his writings assume, his main ideas may be stated to be as follows: the impulse dominating all living beings, including man, is the will to live, that is to obtain power and domination, and to overcome all obstacles which make life difficult. The endeavour of the human race should be to rise still higher above the lower races of animals, from which it had emerged. Just as man had evolved from the ape, so the man of the future, the super-man, will evolve from the ape-man of the present, humanity being only a transition and not a goal. He imagined the super-man as a complete man in whom beauty and strength, intellectuality and nobility of character, will-power and profundity are united, a man possessed of a big heart and a high spirit. The code of morality of these master-men will differ from the morality of the herd, the slave-morality, for morality is only an expedient which a race in its struggle for life found useful, and which can and should be modified by the super-men.

Intensely interested in morality and ethics, he attacked the traditional moral standards, and, without actually condemning love, pity, and sympathy, as is erroneously supposed, he suggested an innovation of moral conceptions. This innovation he called *The Transvaluation of Values*. Nietzsche thus preached an intense individualism, an affirmation of life and a love of life. He sang a hymn in praise of the creative faculty, the joy of life, and the healthy sense of existence. He admired the Greek ideal and conception of life. The Greeks, he said, loved not only beauty, but also strength and power, and among them there was a harmony between body and soul, a Dionysian exuberance and enthusiasm. This conception of the Greek genius, with which his artistic soul was intoxicated, the distinction between the Dionysian and the Apollonian elements, he elaborated in his book *The Birth of Tragedy* (1872). Captivated by Darwinism, by the theories of evolution, of natural selection, and of struggle and survival of the fittest, he built upon these his theory of the new race, the new aristocracy of the future, the complete men, the masters and rulers. As a moral innovator, he constantly attacked Christianity and Christian ethics. As an individualist, he was an opponent of socialism and communism, of equality and mob-rule. What he preached was the dominion of the great ones, of the noble over the crass crowd that never escapes from the animal in it, and therefore can never attain freedom. Nietzsche has frequently been accused of being responsible for German perversion, and for that attitude which led to the European War. This is only partially true, for he himself had frequently attacked German culture and German nationalism. Indirectly he may have been responsible for the German state of mind, but only indirectly, because his poetical and mystical philosophy was misunderstood. Nietzsche himself misunderstood both science and the value of the essence of Christianity as preached by its Founder. And as he did misunderstand, so was he, in turn, misunderstood by many of his admirers, who took liberty to be synonymous with licence, freedom with anarchy, and strength with brutality. His teaching has anyhow exercised an immense influence upon the literature of the last decade of the nineteenth and the beginning of the twentieth century. It can be traced in the works of Ibsen and Gorky, of Strindberg and Przybyszewski, of Sudermann and D'Annunzio, as well as in those of G. B. Shaw. Nietzsche's works include: *The Birth of Tragedy* (1872); *Human, All Too Human* (1878); *The Dawn of Day* (1881); *The Joyous Wisdom* (1882); *Thus Spake Zarathustra* (1883–4); *Beyond Good and Evil* (1886); *The Genealogy of Morals* (1887); *The Twilight of the Idols* (1889); and *Ecce Homo*, published in 1908.—Bibliography: *Works*, English translation, edited by Oscar Levy (18 vols.); H. L. Mencken, *The Philosophy of Nietzsche*; Chatterton-Hill, *The Philosophy of Nietzsche*; A. Fouillée, *Nietzsche et l'Immoralisme*; H. Lichtenberger, *La Philosophie de Nietzsche*; A. Ludovici, *Who is to be Master of the World?*

Nieuport (Fl. *Nieuwpoort*), a town of Belgium, province of Flanders, on the Yser. It is connected by canal with Furnes. Nieuport played an important part during the European War (battle of the Yser). In 1920 it was awarded the Croix de Guerre. Pop. 4000.

Nièvre (nyāvr), a department of Central France, watered by the Loire, Nièvre, Allier, Cure, Yonne, and Aron; area, 2658 sq. miles. It is generally hilly, produces some good wine, and has nearly a third of its surface afforested. Minerals include iron and coal. Nevers is the capital; other towns are Château Chinon, Clamency, and Fourchambault. Nièvre forms a part of pre-Revolutionary Nivernais. Pop. (1921), 270,148.

Nigella, fennel-flower, or love-in-a-mist, a genus of annual plants, nat. ord. Ranunculaceæ, comprising some twenty species, with finely-cut leaves resembling those of fennel. The seeds of *N. sativa*, a native of Southern Europe and the Levant, are pungent and aromatic, and are used as seasoning in Eastern countries, sometimes also in Europe. Some species are cultivated for their flowers, such as *N. damascena*, whose flowers are pale blue.

Niger, a river of West Africa and the third of that continent, rises on the inside of the coastal rampart in the Futa Jallon Hills (French Guinea), flows as far as Timbuktu, and then, instead of following its ancient course through the Sahara to the Gulf of Gabes, turns completely round, breaks through the rampart at Bussa, and reaches the sea (Gulf of Guinea) on the coast it started from after a course of 2600 miles.[1] It is of considerable value as a commercial highway, for its main fall from 2764 feet at its source to 1000 feet above sea-level, where it receives the Tankisso tributary, takes place in the first 260 miles of its course. Baro is at the head of ocean navigation. Below Segu, the Niger enters an old lake floor, over which it spreads in the form of a delta, the branches of which collect in the Debo Swamp. Formerly this lake extended far into the Sahara, and had, at an earlier date, an exit through the Sahara to Algeria and the Mediterranean. At Kabara the port of Timbuktu, the river comes up against the Saharan plateau, and flows due east at the foot of it for 250 miles, contracting to a stream hardly 100 yards across. From here the Niger flows south-east to the granite-bar of Bussa that it has worn down so much that this impediment no longer guards the inland water from the encroachment of the coastal streams. Between Bussa and Rabba there are several rapids but no tributaries of any size enter the river from Kabara to Rabba, and as a result of loss by evaporation and soakage the Niger is not as big as its tributary, the Benue, at their confluence. The delta commences at Abo, 80 miles from the sea, and although the Niger discharges a larger volume of water than the Nile it reaches the Atlantic by so many outlets, scattered along 250 miles of coast, that its true mouth was uncertain until the brothers Lander (1830) descended the river from Bussa to the sea. Mungo Park lost his life in the rapids at Bussa (1805).

Nigeria, a British colony and protectorate of West Africa, drained by the Niger and its tributary, the Benue. The northern rivers flow into the swamps of Lake Chad. The coasts are low, swampy, and mangrove-fringed, but the land rises towards the north and forms a central highlands, dry and healthy, at an altitude of fully 6000 feet above sea-level. Lagos is the seat of the central government. The colony is divided into two parts or groups of provinces, northern and southern, each under a Lieutenant-Governor appointed by the Crown and subordinate to the Governor.

Area, &c.—The total area is approximately 332,000 sq. miles, and the pop. 17,500,000 (including about 3000 Europeans, 1919) divided as follows: Northern Province (area, 256,000 sq. miles; pop. 8,670,000); Southern Province (area, 76,000 sq. miles; pop. 8,900,000). Nigeria is one of the most densely peopled regions of Africa.

Social Conditions.—In the Northern Province Mahommedanism is the prevailing religion, with Kano (q.v.) as its centre, and embraces the Hausa, Fulani, and other tribes. Paganism predominates in parts, but both Protestant and Roman Catholic missions are established.[1] Education follows the principles adopted for the Anglo-Egyptian Sudan and is strictly secular, religious teaching being entirely optional. The principal schools are located at Kano. In the Southern Provinces there are four British Protestant societies, and two French Roman Catholic societies who have established churches and stations. Education is progressive, and there is an elementary and secondary school system with a residential school at Bonny, a mission grammar-school at Lagos, and a high school at Calabar. The Supreme Court for both provinces is under a Chief Justice of Nigeria; each province has a court comprising the Resident and his assistant, and there are Mahommedan courts and Judicial Councils for the pagans. Cantonments, with Station Magistrates, are located at Kano, Kaduna, Lokoja, Port Harcourt, and Zaria. No child born after

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[1] Most of the great African rivers have been diverted from their original courses

[1] The difficulty of conversion to Mahommedanism or Christianity is enhanced by the fact that, in the former religion two or three wives are allowed, but no wine or spirits; in the latter alcohol is permitted, but only one wife, and it is difficult therefore to persuade the native to choose definitely between them, and impossible to show him that he cannot reasonably have both wives and wine, as the African Church, a new body, would propose.

1st Jan., 1900, may be a slave, and no free person may be enslaved, but slavery still exists in the Northern Provinces although it is dying a natural death, and has meanwhile been shorn of most of its abuses. Great Britain entered Nigeria solely on the question of the manumission of slaves. Slaves were liberated to the number of 7091 in 1919 (7212 in 1917 and 7811 in 1918).

Communications.—In 1919 there were 1126 miles of railway open for traffic. The Nigerian railway system is divided into two (meantime) independent parts, east and west. The western system starts at Lagos (Iddo), crosses the Niger at Jebba by means of a bridge considered to be a triumph of engineering, and runs to Kano, via Zaria, Kaduna, Serikin Pawa, and Minna. Branches run from Minna to Baro and from Zaria to Bukuru, the latter a narrow-gauge feeder tapping the Bauchi tin-fields. The eastern system starts at Port Harcourt (discovered 1913, on the Bonny River) and taps the Udi coal-fields at Enugu. Towards the north the eastern system will cross the Benue River at Abinsi, and will run via Kagoro to join the western line at Kaduna, with a feeder from Bukuru to Kagora. The complete system will have a length of over 1600 miles. Ports are located at Lagos, Warri, Burutu, Sapele, Brass, Forcadu, Port Harcourt, Dagema, Bonny, Opobo, and Calabar. In the Northern Province Kano is an emporium for the caravan trade from Salaga, the Sahara, Lake Chad, and Wadai. Telegraphs are connected with the system of French Dahomey.

Currency, &c.—Since 1913 West African silver coinage of 2*s.*, 1*s.*, 6*d.*, and 3*d.* pieces has been in circulation, and practically corresponds with that of Great Britain, but there is also a nickel coinage of 1*d.* and $\frac{1}{10}$th of a penny pieces.

Commerce.—The principal trade is connected with the oil palm (q.v.), which produces palm-oil and kernels, both exported in large quantities. The finest palm and the best palm-oil are found in the Niger Delta. Tin ore, cotton, ground-nuts, and hides and skins are also exported.

History.—The history of Nigeria revolves round slavery and the slave trade. At one time a number of 'creeks', now known as mouths of the Niger, but then supposed to be independent rivers, became the 'Oil Rivers' and upon their banks were established 'factories' or trading-stations where palm-oil, shea butter, ivory, and hardwoods were exported. In 1886 the Royal Niger Company was chartered and took over the administration of the county. At that time Nigeria was in the hands of the Fulah kingdom of Sokoto, established by the Sultan Othman Dan Fodio, a contemporary of Napoleon, and equally successful in war. Independent kingdoms existed in Bornu (near Lake Chad) and Ilorin (in the Yoruba country, north of Lagos). By 1851 Lagos was the centre of the West African slave trade, and the hinterland was devastated by terrible raids. Two of the Fulani states bordering on the Niger were subdued by the Company in 1897, and raiding in these territories at once ceased. During 1851 the King of Lagos appealed to the British against a usurper, and British naval forces restored him to the throne on condition that he suppressed the slave trade. He did so, but his son and successor was unable to control the activities of the slave dealers, and ceded his kingdom to Britain in 1861. By this means the greatest stronghold of slavery became a British colony in which individual liberty was free to all. In 1899 the Company surrendered its charter, and on 1st Jan., 1900, its territories became the two protectorates of Northern and Southern Nigeria. On 1st Jan., 1914, both were amalgamated to form the Colony and Protectorate of Nigeria.

Government.—Lieutenant-Governors govern each of the two provinces under the direction of the Governor, who is assisted by an Executive Council. A body described as the Nigerian Council, comprising the Governor, Executive Council, a Nigerian member of the Lagos Chamber of Commerce, a member of the Calabar Chamber of Commerce, a member of the Chamber of Mines, three European and six native members (all nominated by the Governor), acts in a deliberative and advisory capacity. This is (1922) in process of abolition and replacement by a Legislative Council similar to that (Governor, 6 official, and 4 unofficial members) of Lagos. See *West Africa.*—BIBLIOGRAPHY: G. T. Basden, *Among the Ibos of Nigeria*; A Schultze, *The Sultanate of Bornu* (translated by P. A. Bonton); A. H. Unwin, *West African Forests and Forestry*; E. H. L. Schwartz, *A South African Geography.*

Night-blindness is a defect of vision whereby the power of sight is much lessened in dim light. The terms nyctalopia and hemeralopia were formerly used to denote night-blindness and day-blindness respectively, but different writers and nationalities have used them in contradictory senses, hence their use should be avoided.

Night-hawk, or Bull-bat, a species of goat-sucker or night-jar (*Chordiles virginiănus*), a bird universally known in the United States, 9½ inches in length and 23 inches in extent of wing. It flies in the morning and afternoon rather than at night. The general colour is mottled blackish brown and yellow above with brown bars below. It is a bird of strong and vigorous flight, and its prey mostly consists of beetles and other large insects. Other American species are the 'chuck-will's widow' (*Antrostomus carolinensis*) and the 'whip-poor-will' (*A. vocifĕrus*), both of which, like the night-hawk, arrive in May, and leave the States in September or October.

Night-heron, a name given to several species of wading birds belonging to the genus Nycticorax and family Ardeidæ (herons). The species occur in Europe, Asia, Africa, and America, and the name is derived from their nocturnal habits, which, however, are less pronounced during the breeding season. The common European night-heron is the *Nycticŏrax griseus*, a bird well known in many parts of Southern Europe, especially in the region of the Lower Danube, but only occasionally seen in Britain. It is about 20 inches in length, and has three long narrow feathers proceeding from the nape of the neck, and hanging backwards, pure white in colour. The prevailing colours of the upper parts are blackish green and ashy grey, of the under parts straw colour. The food consists of worms, insects, molluscs, frogs, small fishes, &c.

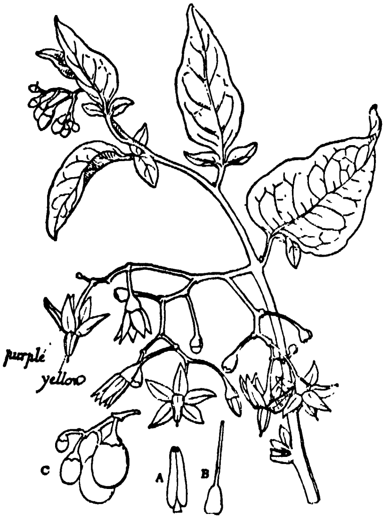
Nightingale, Florence, daughter of William Shore Nightingale, Embley Park, Hampshire, born at Florence 1820, died in 1910. At an early age she manifested a keen interest in suffering humanity, and from philanthropic motives she visited the chief military hospitals in Europe, and studied the chief nursing systems. During the Crimean War (1854) the hospital accommodation was found to be very defective, and Miss Nightingale promptly volunteered to organize a select band of nurses at Scutari. The offer was accepted by the War Office, and within a week Miss Nightingale was on her way to the East, where she rendered invaluable service to the sick and wounded by her incessant labours in nursing and hospital reform. The strain, both mental and physical, which this work demanded permanently injured her health to a serious extent. A sum of £50,000 was raised by public subscription in recognition of her services, and this she devoted to the founding of an institution for training nurses, attached to St. Thomas's Hospital, London. The Order of Merit was conferred upon her in 1907. Her works include: *Notes on Hospitals* (1859), *Notes on Nursing* (1860), *On the Sanitary State of the Army in India* (1863), *Notes on Lying-in Institutions* (1871), and *Life or Death in India* (1873).—Cf. L. Strachey, *Eminent Victorians*.

Nightingale, a well-known perching bird (*Daulias luscinia*) of the thrush family. The nightingale sings at night, and its famed chant is the love-song of the male, which ceases when the female has hatched her brood. It is a native of many parts of Europe and Asia, and of the north of Africa. It is migratory, extending its summer migrations as far north as the south of Sweden. In England, where it appears about the middle of April, it is rather a local bird, some parts appearing to be quite unsuited to its habits; the northern counties are seldom visited, and in Scotland and Ireland it is unknown. It feeds on caterpillars and other larvæ, frequents hedges and thickets, and builds its nest on the ground or near it, laying four or five eggs of a blue colour. The young are hatched in June, and are prepared to accompany their parents in their southward migration in August. It is solitary in its habits, and its colouring is very inconspicuous. Another species (*D. philomela*) is native to Europe east of the Rhine; and a third species (*D. hafizi*) ranges from the Caucasus through Persia and Turkestan.

Nightingale (*Daulias luscinia*)

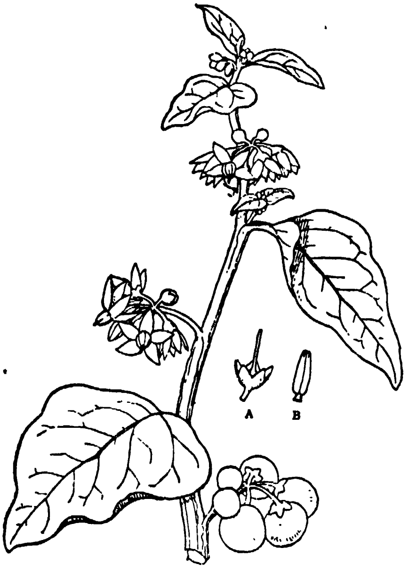
Nightmare, a state of oppression or feeling of suffocation which sometimes comes on during sleep, and is accompanied by a feeling of intense anxiety, fear, or horror, the sufferer feeling an enormous weight on his breast, and imagining that he is pursued by a phantom, monster, or wild beast, or threatened by some other danger from which he can make no exertion to escape. The sufferer wakens after a short time in a state of great terror, the body often covered with sweat. It is the result of the revival during sleep of some intensely emotional experience the memory of which is repressed during waking hours.

Nightshade, the English name of various species of plants, chiefly of the genus Solănum (to which the potato belongs). The woody nightshade or bittersweet (*S. dulcamăra*) and common or garden nightshade (*S. nigrum*) are British plants, the former growing in hedges and among bushes, and the latter in gardens, fields, and waste places. The root and leaves of *S. Dulcamăra* are narcotic, and have been applied to various medicinal uses. The berries, if not absolutely poisonous, are dangerous. *S. nigrum* is fetid and narcotic, and has also been employed medicinally. *Deadly nightshade* is *Atrŏpa Belladonna.* (See *Belladonna.*) For *enchanter's nightshade* see that article.



Woody Nightshade (*Solănum dulcamăra*)

A, Stamen. B, Pistil. C, Fruit.



Black Nightshade (*Solănum nigrum*)

A, Pistil. B, Stamen.

Nigrine, a variety of rutile (mineral titanium dioxide), slightly more ferriferous than rutile, found in black grains or rolled pieces. Its ally *ilmenorutile* may contain 10 per cent of iron peroxide.

Nihilism (Lat. *nihil*, nothing), a term applied in metaphysics to the doctrine that nothing exists, and that consequently no knowledge is possible. It denies the objective reality of either truth or morality. The term nihilism is, however, generally applied to the doctrine of the Russian revolutionary Socialists during the latter half of the nineteenth century. In the beginning, Russian Nihilism was merely an intellectual current of thought, a cult of extreme individualism concentrating all its efforts upon the emancipation of man from the factors of social life. It was concerned not so much with the people as a social collectivism as with man as an individual, man oppressed and fettered by intellectual, moral, and social shackles. As a theory Nihilism criticized religion, family and marriage relations, all the prejudices created by custom and tradition, and aimed at the abolition of all social and political institutions. The term was first used by Turgeniev in 1862, who drew a perfect type of a Nihilist in his novel *Fathers and Sons.* J. de Maistre, however, had already spoken of *rienism* in his correspondence. Nihilism was negation, because it denied and was anxious to abolish the existing order of things; it was destructive because it tended to destroy the whole social structure, but it preached destruction with a view to the pleasure of building up. "La joie de détruire," wrote Bakunin, "est en même temps la joie de créer." The first Nihilists were philosophers, mystics, and altruists. Their aim was the deliverance of the sufferers from the chains of tradition, and the deliverance of the Russians from the oppression of autocracy. Their leaders, such as Tshernyshevski, Mikhailov, Lavrov, and others, were intellectuals, and their propaganda was peaceful. But Tsardom retaliated with prison, exile, and penal servitude, and peaceful propaganda having proved a failure, the Nihilists reverted to terrorist methods. Nihilism in the seventies became synonymous with bombs and dynamite, terror and assassination. Vera Sassaulitsh shot General Trepov, the Chief of the Police, in St. Petersburg (Petrograd) in Jan., 1879, and on the 13th March, 1881, Alexander II was assassinated by a bomb thrown by Grinetzky. Reaction and severe measures against political criminals followed, and the

Nihilist party was crushed. New revolutionary organizations arose, and their struggle for freedom culminated in the Russian Revolution (q.v.) of 1917. The newly gained liberty, however, for which hundreds of thousands of noble men and women had died, was again ruthlessly destroyed by a new foe, who, with Machiavellian cunning, posed as a friend; a veritable Mephistopheles. Russian liberty, the fruits of a struggle which had lasted for over a century, was crushed by Bolshevism, an oligarchy, parading in the Marxian mantle of Communism—made in Germany. — BIBLIOGRAPHY: S. Stepniak, *Underground Russia*; A. S. Rappoport, *Pioneers of the Russian Revolution* (Bibliography).

Niigata (nē-i-gä'tȧ), the chief town of the province of Echigo, Japan, situated on the west coast of Honshu and on the left bank of the Shinanogawa. This port was opened to foreign trade in 1858 as one of the five treaty ports; but the obstructed state of the river, the open anchorage, and the severe winter have hitherto prevented the development of trade apart from traffic with Vladivostok and Siberian ports. The town is well built, the streets are traversed by canals, there is a hospital and a college, and a considerable coasting trade. Pop. 97,274.

Nijmegen, Nymegen (nī'mā-gen), or **Nimeguen** (nim'e-gen), a city in the Dutch province of Gelderland, delightfully situated on the slopes of several hills, reaching down to the Waal. It has a fine old church (St. Stephen's), and a Renaissance town hall of the sixteenth century. The industrial occupations include tanning, brewing, metal goods, cotton manufactures, &c. The town is celebrated for the treaty of peace concluded in 1678 between France and Holland, and Spain, and for that of 1679 between the German Empire, France, and Sweden. It was formerly a strong fortress, but the fortifications have been changed into promenades. Pop. (1919), 66,830.

Nijni-Nov'gorod, a government in Central Russia; area, 19,790 sq. miles; pop. about 2,000,000. The surface forms an extensive plain, occasionally broken and diversified by low undulating hills. It is drained by the Volga. The soil is poor, and the crops, chiefly hemp and flax, not very abundant. A large part is covered with forests.

Nijni-Novgorod, capital of the government of same name, at the junction of the Oka and Volga, 255 miles east of Moscow. The town forms three parts: the upper district, including the citadel; the lower portion, called the Nijni Bazaar; and the suburb, occupied by the great annual fair, and containing 6500 booths, besides other structures for its accommodation. This fair, begun in 1816, was held annually between 15th July and 1st Sept., old style. Here there was gathered together an immense multitude of people (say 250,000) from all parts of Russia and many parts of Asia, and the annual value of the merchandise sold before the European War was estimated at about £40,000,000. The chief products sold are cotton, woollen, and linen goods, tea, silk and silk goods, metal wares, furs, leather, porcelain, earthenware, glass, coffee, and wine. Pop. 112,300.

Nijni-Tagilsk (nizh-nē-tȧ-gilsk'), a town of Russia amid the Ural Mountains, in the government of Perm, and 150 miles east of the town of Perm, in the midst of a district very rich in minerals. Pop. about 45,000.

Ni'kē, in Greek mythology, the goddess of victory, the daughter of Styx and the giant Pallas. She was rewarded by Zeus with the permission to live in Olympus, for the readiness with which she came to his assistance in the war with the Titans. There is a temple to her on the Acropolis of Athens still in excellent preservation.

Nikopolis (Gr. ' City of Victory '), the name of several ancient cities of which the principal are—*Asia*: 1. A town of Bithynia, on the coast of the Bosporus, a few miles north of Chalcedon. 2. A town of Cappadocia, founded by Pompey on the spot where he gained a decisive victory over Mithridates. *Africa*: A town of Ægypt, founded by Augustus Cæsar in 24 B.C. on the place where he defeated M. Antonius, and in commemoration of the surrender of Alexandria. *Europe*: 1. A city of Epeirus, erected by Augustus, now represented by the town of Préviso. It commemorated the victory of Actium (31 B.C.). 2. A town of Thrace, near the mouth of the Nessus, presumably founded by Trajan. 3. A town of Thrace, erected by Trajan in memory of his victory over the Dacians.

Nile (Gr. *Neilos*, Lat. *Nilus*), a historic river, the largest of Africa, and the longest in the world except the Missouri-Mississippi. Its main stream, known as the *Bahr-el-Abiad*, or White Nile, has its chief source in the equatorial lake Victoria (Nyanza). It actually rises, however, near to the parallel of 4° s. lat. as the Shimiyu, coming from the direction of Lake Manjaro. What is known as the *Bahr-el-Azrek*, or Blue Nile, a much smaller stream, joins the White Nile at Khartoum, lat. 15° 40′ N. The source of the Blue Nile was discovered in the Abyssinian Highlands (Lake Tsana) by Bruce in 1770, while the actual source of the other, or true Nile, was for long the subject of speculation and exploration. The Nile, near where it flows out of Lake Victoria (altitude, 3867 feet), forms the Ripon Falls, and discharges into Chioga Lake (altitude, 3318 feet). It then traverses a steep gorge, passes the Murchison Falls, and enters the Albert (Nyanza) (altitude,

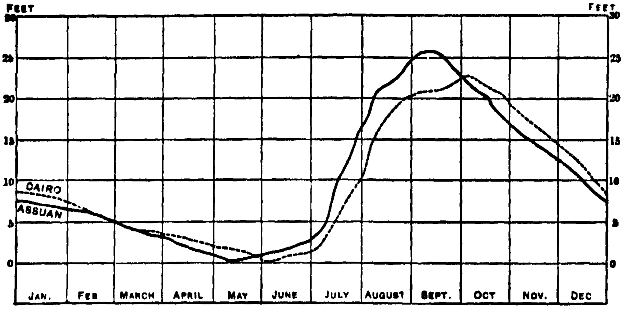


Diagram illustrating the rise and fall of the Nile at Cairo and Aswan in an ordinary year. There is a 'false rise' in May, which precedes the actual flood, purging the river side of sewage and rotten foliage, besides bringing down putrescent green-stuffs from the swamps of Equatoria.

2229 feet), falling, therefore, through 1488 feet in 242 miles (6 feet fall in 1 mile).

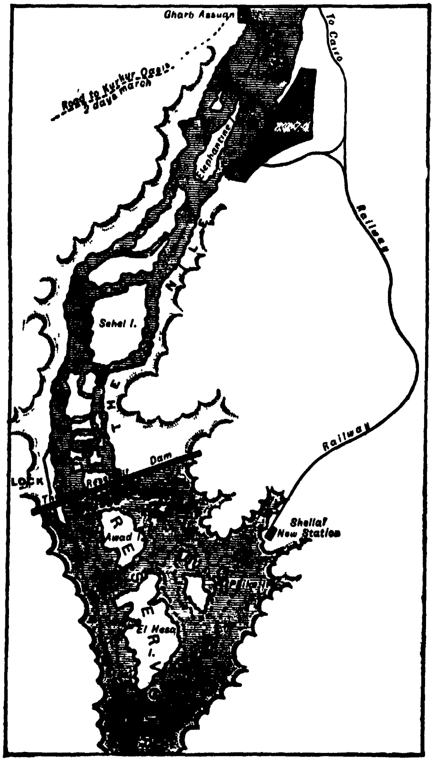
From Albert Nyanza the Nile flows north as the *Bahr-al-Jebel*, or mountain river, to Lake No (altitude, 1850 feet), a distance of 720 miles, and a fall of 1 foot to the mile. Lake No is on the *Bahr-al-Ghazal*, a part of the Nile that is practically stagnant, and covered with floating reeds and papyrus, called 'sudd'.

From its junction with the Sobat, the Nile becomes the *Bahr-al-Abiad*, and is joined at Khartoum by its most considerable affluent, the *Bahr-al-Azrek*, or Blue Nile. Without the Blue Nile the river would be unable to reach Lower Egypt, and the Bahr-al-Ghazal would be a drainless area similar to Lake Chad. Its last tributary, the Atbara, comes from the hills around Lake Tsana, and for the rest of its course (1500 miles) the Nile receives no contributory stream. From Khartoum to Aswan is the Nubian Nile, embracing all the cataracts, and at Aswan begins the Egyptian Nile, without which the history of Egypt could never have been written, and her natural wealth would have remained for ever obscure.

In Egypt, at the head of the Delta, 18 miles north of Cairo, it divides into two main branches, leading down respectively to Rosetta and Damietta, where they enter the Mediterranean. As rain scarcely ever falls in the greater part of the valley of the Nile, the river owes its supplies to the copious rains and the vast lake areas of the tropical regions in which it takes its rise, and its volume thus depends upon the season. It begins to increase in June, attains its greatest height about September, and then subsides. (See *Sudan*.) The ordinary rise at Cairo is about 25 feet. During the flood a great portion of the Delta, and of the valley higher up, is inundated. This annual inundation, now controlled by the great Aswan dam and other works, is watched and waited eagerly, and in ancient times caused the Nile to be worshipped as a god by Egyptians, Greeks, and Romans. Its length is nearly 4200 miles.—Cf. W. S. Churchill, *The River War*, which contains excellent maps and matter descriptive of the two Niles.

Nilghiris, a district of India, in Madras Presidency, comprising entirely the area of the Nilghiri Hills. It produces little save native food-grains and coco-nuts. Area, 1009 sq. miles; pop. 118,600.

Nilsson, Christine, born at Hassaby, near Wexiö, in Sweden, 1843. Accompanied by her brother, she used to sing at village fairs and



The Aswan Dam and the Reservoir when Full

The dotted lines show the banks of the river and the shore of the islands when the reservoir is low.

places of public resort, where she also played on the violin. In 1857 her talent attracted the attention of a wealthy gentleman, who had her educated as a singer at Stockholm, and afterwards at Paris. In 1864 she made her first appearance as Violetta in *La Traviata* at the Théâtre Lyrique, Paris, and she appeared in 1867 for the first time at Her Majesty's Theatre, London. Among her most famous impersonations are Ophelia in Thomas's *Hamlet*, and Margaret in Gounod's *Faust*. In 1872 she married M. Auguste Rouzaud, who died in 1882; in 1886 she married Count A. de Miranda. She died in 1921.

Nimach, or **Neemuch**, a town and cantonment of Gwalior, Central India, 1613 feet in altitude. It is on the railway between Indore and Ajmer Merwara. Pop. 12,000.

Nimbus, a term applied in art, especially in sacred art, to a kind of halo or disc surrounding the heads of sacred persons, of Christ, the angels, or saints; as also to a disc or circle sometimes depicted round the heads of emperors and other great men. The nimbus in representations of God the Father is of a triangular form, with rays diverging from it all round; in representations of Christ it contains a cross more or less enriched; that of the Virgin Mary consists of a circlet of small stars, and that of angels and saints is a circle of small rays. When the nimbus is depicted of a square form, it indicates that the person was alive at the time of delineation. Nimbus is frequently confounded with *aureola* and *glory*.

Nîmes, or **Nismes** (nēm; ancient **Nemausus**), a city of Southern France, capital of the department of Gard. It is an episcopal see. Its manufactures are chiefly of silk and cotton goods; it has a considerable commerce, and is the great entrepôt of Southern France for raw silk. Among the buildings is the cathedral of S. Castor; but Nîmes is chiefly remarkable for its Roman remains, including an ancient temple, with thirty beautiful Corinthian columns, now serving as a museum and known as the *Maison Carrée*; the amphitheatre, a circus capable of seating 20,000 persons; the temple of Diana; the ancient Tour Magne, on a hill (Mont Cavalier) outside of the city, supposed to have been a mausoleum; and two Roman gateways. Nîmes was, for about 500 years, in the possession of the Romans. In the sixteenth century it became a stronghold of Calvinism, and suffered much during the civil wars, as also by the revocation of the Edict of Nantes, and during the Revolution. Pop. 80,440.

Nimrod, described in *Gen.* x, 8–12 as a descendant of Ham, a son of Cush, a mighty hunter before the Lord, and the beginning of whose kingdom was Babel, Erech, Accad, and Calneh in the land of Shinar.

Nin′eveh, an ancient ruined city, formerly capital of the Assyrian Empire, in Mesopotamia, on the Tigris, along which, and opposite to the town of Mosul, it occupied an extended site. The first recorded notice of Nineveh is in *Gen.* x. Again it is spoken of in the book of *Jonah* as a "great city". It remained the capital of Assyria till about 606 B.C., when it was taken and burned by the Babylonian Nabopolassar and the Median Cyaxares. It was maintained as a local tradition that this ancient capital of Assyria lay buried on the left bank of the Tigris opposite Mosul; but the fact was not definitely settled until in 1841 M. Botta began excavations in the vast mounds which there existed. He was followed in this by A. H. (afterwards Sir Henry) Layard, who explored a great portion of the large angle formed by the Tigris and the Zab. In the mounds of Kuyunjik, opposite Mosul, he excavated the palaces of Sennacherib, Assurbanipal, and Esarhaddon. The walls of the city, which the inscriptions describe as Ninua, stretch along the Tigris for 2½ miles, and the elaborate outworks, moats, and defences can still be traced. The important discoveries made by Layard were continued by Loftus, Hormuzd Rassam, and G. Smith, and the result of their labours deposited in the British Museum.—Cf. Sir A. H. Layard, *Nineveh and its Remains*.

Ning-po, a city of China, in the province of Che-kiang, and on the Takia or Ning-po River, about 16 miles from its mouth. It is surrounded by a wall 25 feet high, 15 feet wide, and 5 miles in circuit, built in A.D. 870. The site of the former city of Ning-po, which existed 2200 B.C., is near the modern city. Ning-po was declared a treaty port in 1842. Pop. about 450,000.

Ninian, St., a missionary preacher who spread Christianity among the Picts in the beginning of the fifth century. He was ordained bishop of the Southern Picts by Pope Siricius in 394. Ninian selected Candida Casa, or Whithorn (Wigtownshire), as his chief seat, but prosecuted his labours in all parts of Southern Scotland, and even as far north as the Grampians. He died in 432. His festival is the 16th Sept.

Ninus, the fabulous founder of the Assyrian Empire, and of its capital Nineveh. He married Semiramis, wife of Onnes, but was afterwards murdered by his wife, who ruled as regent for her son Ninyas. His temple-tomb near Babylon, nine stades high and ten stades broad, is referred to by Thisbe in *A Midsummer Night's Dream* as "Ninny's tomb".

Ni′obē, in Greek mythology, the daughter of Tantalus, King of Lydia, married to Amphion, King of Thebes. Proud of her numerous progeny, she provoked the anger of Apollo and Artemis (Diana) by boasting over their mother Leto (Latona), who had no other children but those two. She was punished by having all her children put to death by those two deities. She herself was metamorphosed by Zeus (Jupiter) into a stone (on Mount Sipylus, Asia Minor) which shed tears during the summer. This fable has afforded a subject for art, and has given rise to the beautiful group in the Uffizi Gallery at Florence, known by the name of *Niobē and her Children*.

Nio'bium, or **Columbium** (chemical symbol, Cb; atomic weight, 93·1), a rare metal discovered in 1801 in the black mineral *columbite* from North America. The element is comparatively rare, but exists in minute quantity as the pentoxide in a considerable number of minerals. It is almost invariably associated with tantalum. It is a steel-grey metal of specific gravity 12·75, and melting-point 1950° C., and is only slightly attacked by acids. Like tantalum it has a marked influence on the properties of steel when associated with it.

Niort (ni-ōr), a city of France, capital of the department of Deux-Sèvres, on two hills washed by the Sèvre-Niortaise. Its town-house and the keep of the old castle are interesting buildings. The staple manufactures are leather and gloves, and the trade, particularly in claret, is extensive. Niort was a Huguenot centre during the Wars of Religion. Pop. 23,775.

Nipa, a genus of palms of which there is but one species, *N. fruticans*, a native of the East Indies, Philippines, &c., growing on marshy coasts. It has no stem, fronds about 20 feet long, and edible fruits.

Nip'igon, or **Nep'igon**, a lake of Canada, in Ontario, about 30 miles north-west of Lake Superior. It is about 70 miles long and 40 miles broad; area, 1730 sq. miles. It is connected with Lake Superior by the Nipigon River, a famous trout-stream.

Nipis'sing, Lake, a lake of Canada, in Ontario, north-east of Lake Huron, irregular in coast-line; length, 48 miles; breadth, 20 miles; area, 330 sq. miles. It contains numerous islands, and finds its only outlet by French River (55 miles) into Lake Huron. The lake will form a part of the Georgian Bay Canal.

Nipplewort, a plant of the genus Lapsăna (*L. communis*), nat. ord. Compositæ, growing commonly as a weed by the sides of ditches and in waste places.

Nippon. See *Japan*.

Nirvana (Skt. *nirvăna*, blowing out or extinction, i.e. of sin; from *vă*, to blow). Nirvana or Nigban is the Tibetan Nyangan. In Buddhism it is a state of spiritual satisfaction, an 'earthly paradise', to live in which the passions must be conquered; there must be absence of desire in this life, an inward peace. Nirvana is synonymous neither with the Christian ideal of a future state, nor yet with annihilation; it is attained in this world and in this life. Death—or transmigration, as the Buddhist doctrine teaches—is the reward of Nirvana. Such a doctrine is prognosticated in the deep melancholy of *Ecclesiastes*, in the choruses of Sophocles, in the despair of Job and Jeremiah, the *Apologia* of Plato, and in the soliloquy of Hamlet; yet this has nowhere led to suicide as the path to Nirvana, but to fasting, prayer, alms-giving, and self-sacrifice. The life of self-sacrifice that so distinguishes Gautama Buddha, his voluntary acceptance of poverty, his proclamation of a universal brotherhood, and his war on the caste system are remarkable features of his career. But after him Brahmanism rose triumphant, and drove Buddhism into other lands, and the region of Sakya Muni's birth and labours became a place of pilgrimage to peoples from distant lands. According to the *Rajguru* of Assam the Nirvana of Sakya Muni occurred 196 years before Chandragupta, in the eighteenth year of Ajatra Satru.

Nisâmî, Abu Mahomet Ben Yusef, Sheikh Nisâm-ed-Dîn, one of the great poets of Persia, and the founder of the romantic epic, born about A.D. 1100, died in 1180. He was a special favourite of the Seljuk princes, who then ruled in Persia. Besides a *Divan*, or collection of lyrics, he wrote five larger poems, which have been extensively circulated in Persia and India.

Ni'san, a month of the Jewish calendar, the first month of the sacred year and seventh of the civil year, answering nearly to our March. It was originally called Abib, but began to be called Nisan after the captivity.

Nish, or **Nissa** (ancient **Naissus**), a town of Yugo-Slavia, in Serbia, on the Nishava, 150 miles south-east of Belgrade. It is the seat of a Greek bishop, and has celebrated hot springs and baths. It was the native place of the Emperor Constantine the Great. Nish, which became the temporary seat of the Serbian Government on the outbreak of the European War, was captured by the Bulgarians on 5th Nov., 1915, and retaken by the Serbians on 12th Oct., 1918. Pop. 24,950.

Nish'apur, an ancient city of Persia, in the province of Khorasan. Turquoises of excellent quality have long been found in its vicinity. Omar Khayyam was born (1123) and is buried there. Pop. about 15,000.

Nis'ibis, or **Antiochia Mygdoniæ**, the modern *Nisbin*, an ancient city of Mesopotamia, on the Mygdonius. During the European War it was a strategic point as the eastern terminus of the Bagdad Railway.

Nisi prius, a law phrase meaning 'unless before', and occurring originally in a writ by which the sheriff of a county was commanded to bring the men empanelled as jurors in a civil action to the court at Westminster on a certain day, 'unless before' that day the justices came thither (that is, to the county in question) to hold the assizes, which they were always sure to do. The judges of assize, by virtue of their commission of *nisi prius*, try the civil causes thus appointed in their several circuits, being said to sit at *nisi prius*, and the courts in which these actions are tried being called courts of *nisi prius*, or *nisi prius* courts. A trial at *nisi prius* may be defined in general as a trial, before a judge and jury, of a civil action which has been brought in one of the superior courts.

Nitella, a genus of stoneworts or Charophyta differing from Chara by the internodes being naked, and in the detailed structure and arrangement of the sexual organs.

Nitrate, a salt of nitric acid. The nitrates are generally soluble in water, and are readily decomposed at high temperatures. Deposits of nitrates of calcium and certain alkali metals are present in small quantities in almost all soils. Potassium nitrate or nitre (q.v.) occurs thus in commercial quantities in the plains of Northern India, and enormous accumulations of sodium nitrate exist in Northern Chile. These latter deposits, which are known as Chile saltpetre, cubic nitre, or soda nitre, are found on an arid plateau above the coast. The great value of this nitrate lies in its application to agriculture as a fertilizer on impoverished soil. All crops require nitrogen in order to build up the complex organic nitrogen compounds found in their tissues. The most economic form in which this nitrogen can be supplied is as sodium nitrate, potassium nitrate being taken up by the trade in explosives. The effect of a nitrate as a manure is enormous, in certain cases giving a crop three times as heavy as when no nitrogen is supplied. Nitrates are formed in the soil from ammonium salts by certain species of bacteria, the nitric acid ultimately produced combining mostly with lime derived from calcium carbonate in the soil. Nitrates should not be used as fertilizers on light porous soils where the rain will sink the manure below the range of the roots.

Nitrate of Silver, or Lunar Caustic, $AgNO_3$, a white crystalline salt obtained by dissolving silver in nitric acid and allowing the solution to crystallize. It forms tabular crystals which are soluble in water and melt at 218° C. The fused product, cast in the form of sticks, is known as lunar caustic, and is used in medicine as a cautery. It is also used in photography and in silvering mirrors for optical instruments. It forms the basis of 'marking-inks', as it is readily reduced to metallic silver on coming in contact with organic matter.

Nitre, also called saltpetre, is the name by which potassium nitrate (KNO_3) is commonly known. It is produced by the action of nitrifying bacteria in soils containing potash and nitrogenous organic matter, and forms an efflorescence upon the surface of the soil in tropical countries, notably India. In some parts of Europe it is obtained by mixing animal matter and loose earth in heaps, which are allowed to stand for several years to oxidize (nitrify), after which the nitre may be extracted by lixiviation. It is chiefly prepared, however, from Chile saltpetre by treatment with potassium chloride. It is a colourless salt which crystallizes in six-sided prisms and possesses a cooling salty taste. Nitre is an essential constituent of gunpowder and of certain blasting-powders and fireworks. It is also used for the preservation of meat, as a diuretic and febrifuge in medicine, and as a flux in metallurgy.

Nitric Acid (HNO_3) is one of the most important compounds of nitrogen. In the pure state it is a colourless, strongly fuming, and corrosive liquid, which boils at 86° C. and has a specific gravity of 1·52. On exposure to light it becomes yellow, due to partial decomposition into nitrogen peroxide, oxygen, and water. The ordinary commercial acid contains about 70 per cent of the pure substance, and is known in the arts as *aqua fortis*. It is commonly obtained by heating Chile saltpetre (sodium nitrate) with concentrated sulphuric acid, when the following reaction takes place: $H_2SO_4 + NaNO_3 = HNO_3 + NaHSO_4$. The operation is carried out in cast-iron or earthenware retorts, the nitric acid vapours being condensed in a series of water-cooled earthenware spirals. The residue in the retorts, known as 'nitre-cake', which consists mainly of sodium bisulphate, is run out in the liquid state into iron trays and allowed to solidify.

Nitric acid is a strong acid, forming with metallic bases a series of salts, the nitrates. It contains about 75 per cent of oxygen, a great part of which it readily yields to other substances, acting in this manner as a powerful oxidizing agent. Thus starch, sugar, and other organic substances, when treated with the moderately dilute acid, are oxidized at its expense with the production of lower oxides of nitrogen. When the concentrated acid is used, nitro-compounds are frequently formed, containing the group $-NO_2$ in place of part of the hydrogen of the original substance. In this manner nitro-cellulose (gun-cotton), nitro-glycerine, and tri-nitro-toluene (the high explosive known as T.N.T.) are produced. A mixture of concentrated nitric and hydrochloric acids, known as *aqua regia*, or nitro-muriatic acid, is used as a solvent for gold and platinum. Nitric acid is employed in etching on steel and copper; in metallurgy and assaying; and also in chemical industry, mainly in the manufacture of intermediate products for dyes and drugs

Until a few years ago the only method of practical importance for the manufacture of nitric acid was the one in which Chile saltpetre is used. The supply of this material though large is not inexhaustible; at the present rate of consumption it is estimated to last for not more than fifty years. During the last two decades a vast amount of research has been carried out with a view to obtaining nitric acid and other nitrogenous compounds from nitrogen, which forms four-fifths of the volume of the air.

When air is subjected to a high-tension electrical discharge, a small proportion is converted into nitric oxide (NO), by direct combination between the elements, at the very high temperature produced by the arc. This gas can be readily converted into nitric acid, which is now manufactured by the above method on a commercial scale.

The principal processes at present in successful technical operation are the Birkeland-Eyde, the Schönherr, and the Pauling. The only essential difference between them lies in the construction of the electric furnaces used. In the Birkeland-Eyde process this consists of a sheet-steel chamber in the form of a low wide cylinder resting on its side. It is lined internally with fire-brick so as to leave a narrow disc-shaped space in the centre, into which project the electrodes, consisting of water-cooled copper tubes, the ends of which are placed about ½ inch apart in the centre of the furnace. Perpendicular to these are the two poles of an electro-magnet. The electrodes are supplied with alternating current at about 5000 volts, whilst direct current is fed to the coils of the electro-magnet, which has the effect of deflecting the arc so that it presents the appearance of a circular sheet of flame. A current of air is driven through the furnace, remaining in contact with the arc, which has a temperature of about 3200° C., for a very short time. The hot gases leaving the furnace contain up to 1·5 per cent of nitric oxide; they are cooled and passed into large oxidation chambers, and then to absorption towers filled with fragments of quartz, down which trickles an absorbing liquid. If water is used, a solution of nitric acid is obtained; with caustic soda solution, sodium nitrate or nitrite is formed, according to whether oxidation of the gases has been complete or partial. Owing to the large amount of power required, these processes are mainly in operation in Scandinavia and other countries where an abundant supply of cheap water-power is available.

A process, known as the Ostwald process, for the manufacture of nitric acid by the catalytic oxidation of ammonia by atmospheric oxygen has also been used with considerable success. The ammonia used is obtained either as a by-product from the manufacture of coal-gas (see *Coal-tar*; *Gas Manufacture*), or from calcium cyanamide (see *Cyanamide*), which is itself prepared by the action of atmospheric nitrogen on calcium carbide (q.v.). A process for the direct synthesis of ammonia from its elements nitrogen and hydrogen, which promises to become of great importance, has been devised by Haber and recently improved by Claude.

During the European War practically all the nitric acid used by the Allies for the manufacture of explosives was obtained from Chile saltpetre, but the Central Powers, owing to the blockade, had ultimately to rely entirely on the synthetic acid produced by one or other of the above-mentioned methods.—BIBLIOGRAPHY: G. Martin and W. Barbour, *Industrial Nitrogen Compounds and Explosives*; Sir Edward Thorpe, *Dictionary of Applied Chemistry*; *Physical and Chemical Data of Nitrogen Fixation* (Ministry of Munitions, Nitrogen Products Committee).

Nitrides, a name given to the compounds of nitrogen with other elements, e.g. phosphorus, boron, silicon, and the metals. Magnesium nitride is formed when nitrogen is passed over heated magnesium.

Nitrification, a bio-chemical process carried on in soil—and also in sea-water—by certain bacteria, particularly species of Nitrobacter and Nitrosomonas, consisting in the oxidation of ammonia—produced by putrefaction and decay—to nitrates. It is of the very greatest importance in the economy of nature, because nitrates form the normal source of nitrogenous food for green plants, and thus also for the animal kingdom.

Nitro-benzol, or **Nitro-benzene** ($C_6H_5NO_2$), is prepared by adding gradually, with stirring, a mixture of 12 parts concentrated nitric acid and 16 parts concentrated sulphuric acid to 10 parts benzene contained in an iron or earthenware vessel. The temperature is kept below 30° C. until all the acid has been added; the mixture is then heated to 75° C. for a short time to complete the reaction. The nitro-benzol, which floats on the surface of the waste acids, is separated and distilled. It is a pale-yellow, highly refracting liquid; boiling-point, 211° C.; specific gravity, 1·2. It has a strong odour of bitter almonds and is poisonous, but in spite of this it is used in perfumery under the name of ' oil of mirbane '. It is manufactured on a large scale, since on reduction it yields aniline, the parent substance of many dyes and drugs.

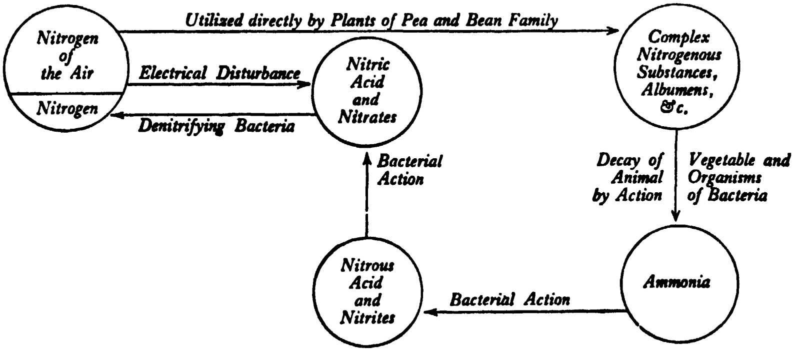
Nitro-compounds, compounds derived from hydrocarbons and other organic compounds by the substitution of the univalent nitro-radical NO_2 for hydrogen.

Nitrogen (chemical symbol, N; atomic weight, 14·008), an element occurring in the free state in the atmosphere, of which it forms 78·06 per cent by volume. It also occurs in small quantity in the gases of volcanoes, and in some mineral-springs. In the combined state the element is very common both in the animal and in the vegetable kingdom; e.g. proteins, albumens, alkaloids, &c., contain nitrogen combined with carbon, hydrogen, and oxygen. Large quantities occur combined with sodium or potassium and oxygen in Chile saltpetre ($NaNO_3$) and saltpetre (KNO_3), and united with hydrogen in ammonia and ammonium salts. Nitrogen is a colourless, tasteless gas which may be liquefied at low temperature and high pressure, the boiling-point at 760 mm. pressure being −196° C. Chemically it is an inert substance, and does not readily combine with oxygen nor hydrogen nor with the metals at ordinary temperatures. At high temperatures it unites with metals, forming *nitrides*. It forms five oxides, which are prepared indirectly from the nitrates. These are: *nitrous oxide* or laughing gas, N_2O (q.v.); *nitric oxide*, NO, prepared by the action of metallic copper on nitric acid, a colourless gas which becomes brown on exposure to air, forming nitrogen peroxide; *nitrogen peroxide*, NO_2, formed by heating dry lead nitrate, a deep-brown gas with an unpleasant odour; it dissolves in cold water, giving an acid solution containing a mixture of nitric and nitrous acids; *nitrogen trioxide*, or *nitrous anhydride*, N_2O_3, formed by reducing nitric acid with arsenious oxide; it is a brown gas which when cooled to −21° C. is a deep-blue liquid; it dissolves in water, giving a solution of *nitrous acid. Nitric anhydride* or *nitrogen pentoxide*, N_2O_5, obtained by dehydrating nitric acid with phosphorous pentoxide, is a white solid melting at 30° C.; dissolved in water it yields a solution of nitric acid. Nitrogen forms compounds with hydrogen, the most important being ammonia. The nitrates and nitric acid are the most important compounds of nitrogen. Recently an active form of nitrogen has been prepared by subjecting the gas to electric discharge; in this form it readily transforms yellow phosphorus into red phosphorus, and reacts with nitric oxide to form nitrogen peroxide.

Nitrogen may be prepared by the decomposition of ammonium nitrite, $NH_4NO_2 = N_2 + 2H_2O$; or by the decomposition of ammonium dichromate, $(NH_4)_2Cr_2O_7 = N_2 + Cr_2O_3 + 4H_2O$; or by passing air over heated metallic copper to remove oxygen and collecting the residual gas. Commercially the substance is prepared from liquid air by fractional distillation; liquid nitrogen, being more volatile than liquid oxygen, distils over first.

Nitrogen is an essential constituent of plant and animal tissues. It is therefore an important fact of nature that large supplies of it are available for building up plants. Plants cannot generally utilize nitrogen as such with the exception of the leguminosæ; these are able to absorb nitrogen from the atmosphere by means of bacteria which are present in the roots; these bacteria utilize atmospheric nitrogen, and thereby supply the plant. All other plants absorb nitrogen by their roots in the form of nitrates.

There is a complete nitrogen cycle in nature. Nitrogen of the atmosphere is transformed in small quantity into *nitric acid* by means of electrical disturbances. This nitric acid dissolves and finds its way by means of rain into the soil, where it is transformed into *nitrates* and absorbed by the plant roots. As vegetable and animal matter decays, it is attacked by bacteria which transform the nitrogenous substances into *ammonia*; the ammonia so produced is carried into the soil, and there it is attacked by bacteria which transform it into *nitrites*, the salts of *nitrous acid*. These nitrites are in turn attacked by bacteria and transformed into *nitrates*, and these are absorbed by the plant and transformed into complex nitrogenous bodies. Nitrogen is thus continuously absorbed from the air and transformed into compounds to be used again


Utilized directly by Plants of Pea and Bean Family
Nitrogen of the Air
Nitrogen
Electrical Disturbance
Denitrifying Bacteria
Nitric Acid and Nitrates
Complex Nitrogenous Substances, Albumens, &c.
Bacterial Action
Decay of Animal by Action
Vegetable and Organisms of Bacteria
Nitrous Acid and Nitrites
Bacterial Action
Ammonia

in building up fresh supplies of nitrogen compounds.

Synthetic methods have recently been introduced, whereby both nitric acid (q.v.) and ammonia may be produced from atmospheric nitrogen, directly or indirectly. It is calculated that there are about 20,000,000 tons of nitrogen in the air over every square mile of the earth's surface, so that the amount of raw material for the synthetic production of important nitrogen compounds is practically unlimited. The inertness of nitrogen to chemical reagents at moderate temperatures has rendered this supply useless until recent years. See *Nitric Acid*; *Ammonia*; *Cyanamide*.

Nitro-glycerine. See *Explosives*.

Nitrolim, or **Nitrolime,** the trade name for calcium cyanamide. At the great works at Odda, in Norway, the cyanamide is ground to a fine powder, and sent out in bags with a double lining as *nitrolim*. See *Cyanamide*; *Nitric Acid*; *Nitrogen*.

Nitrous Ether, $(C_2H_5)NO_2$, is the nitrite of the organic radical ethyl. It is a yellowish liquid, and when mixed with about four times its volume of rectified spirit forms the *nitrous ether*, *nitric ether*, *spirit of nitrous ether*, or *sweet spirit of nitre* of the Pharmacopœia. This mixture is often employed to increase the flow of urine, and to counteract feverishness.

Niue, Iniue, or **Savage Island,** a Pacific island in the Micronesian division of Oceania (18° 5′ s. lat., 169° 52′ w. long.), attached to New Zealand since June, 1901. It is composed of two coral terraces, 90 feet and 220 feet respectively in altitude, but only the lower terrace is inhabited. Bananas and coco-nuts are exported. The circumference is 40 miles; area, about 100 sq. miles; pop. (1916), 3880.

Nivelles (Fl. *Nyvel*), a town of Belgium, in the province of Brabant, on the Thines. The church of St. Gertrude was founded in 1048. It is a railway junction and has railway workshops. Paper is manufactured. Pop. 12,000.

Nivernais, a pre-Revolutionary province of France, corresponding to the modern department of Nièvre and part of Yonne. The capital was Nevers. It originated in the ninth century as a county ruled by Otto William of Burgundy, and was erected into a duchy by Francis I.

Nivôse (literally 'snow-month'), the fourth month of the French Revolutionary Calendar, beginning on 21st Dec., and ending on 19th Jan.

Nizam′ (Urdu, *nizām*; Ar. *nidam*, order, administration, arrangement), in India, the title of the ruler of Hyderabad in the Deccan, derived from *nizam-ul-mulk*, governor or regulator of the empire, a name adopted by Azof Jah in 1719, and since that time adopted by his successors.

Noah, one of the patriarchs of the Old Testament, son of Lamech, is described in the book of *Genesis* as being chosen by God for his piety to be the father of the new race of men which should people the earth after the deluge. Having been warned by God of the coming flood, he built a vessel (the *ark*) by His direction, and entered it with his family and all kinds of animals. After the waters had subsided the ark rested on Mount Ararat, where Noah offered a thank-offering to God, and was assured that the earth should never again be destroyed by a flood, as sign whereof God set the rainbow in the clouds. While modern accounts place Mount Ararat in Armenia, older traditions locate it in the mountains of the Kurds, east of the Tigris.

Noailles (no-āy), Adrien Maurice, Duc de, French soldier, was born 1678, and died 1766. During the minority of Louis XV he was President of the Council of Finance and member of the Council of Regency, which he left, however, in 1721, rather than concede the presidency to Cardinal Dubois. Exiled by the influence of Dubois, he was, on his death, recalled and reinstated in his former offices. During the Austrian War of Succession he held a command on the Rhine; and in 1743, through the impetuosity of his nephew, the Count of Grammont, he lost the battle of Dettingen. He served under Marshal Saxe at Fontenoy.

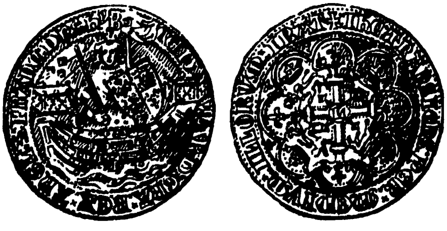
Nobel, Alfred, Swedish engineer and inventor of dynamite, born at Stockholm in 1833, died 1896. His father established a nitro-glycerine business at St. Petersburg (Petrograd) about 1860, and some seven years later the son accidentally discovered a method of lessening the danger of explosion attending the use of that substance. Subsequently he made other important inventions relating to blasting materials, smokeless powder, armour-plates, &c., and established large works at Brefors in his native country.

Nobel Prizes, annual prizes awarded from a fund established under the will of Alfred Nobel. By his will Nobel devoted the bulk of his fortune of over £2,000,000 to the foundation of five annual prizes, each worth about £8000, to be awarded for the most important inventions or discoveries of the year in (1) physical science, (2) chemistry, and (3) medical science or physiology; (4) for the most important literary work of an idealistic character; and (5) for the greatest effort in the cause of international brotherhood and peace. There is no distinction of nationality in the awards, but each candidate must be proposed by a recognized representative of science, literature, &c., before the 1st of Feb. in the year at the end of which the awards are made. There is an English Nobel Prize Committee, while the foundation is administered by a Board of Control at Stockholm. There are also Nobel Institutes, established for the study of physical chemistry and for the advancement of matters connected with literature and peace. The first distribution of the Nobel prizes took place in 1901, the recipients being: W. Röntgen, J. H. van't Hoff, E. von Behring, Sully Prudhomme, H. Dunant, and F. Passy. In 1921 the prizes awarded were: literature, Anatole France; peace, M. H. Branting and M. Chr. Lange. Among British recipients of the prize have been: physics, Lord Rayleigh, J. J. Thomson, Sir W. H. Bragg and W. L. Bragg, C. G. Barkla; chemistry, Sir W. Ramsay, Sir E. Rutherford; medicine, Sir Ronald Ross; literature, Rudyard Kipling; peace, Sir W. R. Cremer; and among women recipients, Madame Curie.

Nobility, a rank or class of society which possesses hereditary honours and privileges above the rest of the citizens. Such a class is found in the infancy of almost every nation. Its origin may be attributed to military supremacy, to the honours paid to superior ability, or to the guardians of the mysteries of religion. Among the ancient Romans the patricians originally formed the nobility; but a new order of nobility arose out of the plebeians, consisting of those who had held curule magistracies and their descendants, enjoying the right of having images of their distinguished ancestors. Among the ancient German tribes only obscure traces of hereditary nobility are found. The dignities of the counts of the Franks, the aldermen and great *thanes* of England, as also of the *jarls* (in England *eorlas*) of Denmark, were accessible to every one distinguished by merit and favoured by fortune. In Venice a civic nobility grew up consisting of a series of families who gradually acquired all political power and kept it to themselves and their descendants. In England hereditary nobility, the nobility belonging to the titles of duke, marquess, earl, viscount, and baron, is now entirely personal, though formerly, as a result of the Norman Conquest, it was connected with the holding of lands. In Spain and Italy still, the same rank depends in greater measure upon property; and in France and Germany the *de* and *von* of titles points to the same fact. In France and Germany nobility is common to all the members of the noble family, and the German nobility formed a very exclusive caste. In France and Germany the nobles long formed a class of petty sovereigns within their own domains. The French Revolution first deprived the nobles of that country of their privileges and exclusive rights, as that of jurisdiction, &c.; and the decree of 19th June, 1790, abolished hereditary rank entirely. Under Napoleon I arose a new hereditary nobility, with the titles of princes, dukes, counts, barons, and chevaliers, which descended to the eldest son. After the restoration of the Bourbons (1814) the ancient nobility reclaimed their former rights and privileges. Nobility was again abolished in 1848, but was restored during the reign of Napoleon III. In Norway the Parliament abolished nobility by the three successive decrees of 1815, 1818, and 1821. In Great Britain titles of nobility can only be conferred by the sovereign, and that by patent, in virtue of which they become hereditary. Life peerages, however, are also conferred. The nobility, as the term is commonly used, consists of those holding the titles already mentioned (or all above the rank of baronet) and their more immediate connections; but if the term were to be used as generally in Europe the gentry would also be included, or all families entitled to bear coat-armour. Those of the nobility who are peers of England, of Great Britain, or of the United Kingdom, have a hereditary seat in the House of Lords, while the Scottish peers elect sixteen of their number to represent their order, and until 1922 the Irish peers used to elect twenty-eight representatives for the same purpose.

Noble, Sir Andrew, British physicist, artillerist, and engineer, born 1831, died 1915. He was educated at Edinburgh Academy and the Royal Military Academy, Woolwich, and entered the Royal Artillery in 1849. He did valuable work as secretary to the Select Committee on Rifled Cannon in 1858, and was the next year appointed Assistant Inspector of Artillery. He joined the firm of Sir W. G. Armstrong & Co. in 1860, and his successful work as an administrator and organizer was soon recognized, and he was elected chairman of the company. His experimental work on guns and explosive actions was the basis of the great improvements found in modern artillery. He was created a baronet in 1902, and received many British and foreign orders.

Noble, an ancient English gold coin, value six shillings and eightpence, first struck in the reign of Edward III, 1844. The noble having increased in value to 10 shillings, a coin of the former value of a noble was issued by Henry VI



Obverse Reverse

Gold Noble of Edward III, 1344, from an example in the British Museum and Edward IV, and called an *Angel*. Half-nobles and quarter-nobles were also in circulation at the same period.

Noctilu'ca, a genus of minute marine animalcules (Protozoa), and the type of a special group. In size and appearance they much resemble a grain of boiled sago, or a little granule of jelly, with a long stalk. These minute animals are phosphorescent; and the luminosity which appears at the surface of the sea during the night is chiefly due to them.

Noddy (*Anous stolidus*), a sea-bird of the family Laridæ (gulls), widely diffused through the northern and southern hemispheres, and well known to sailors for its fearlessness or stupidity, allowing itself even to be captured by hand; hence its name. The noddy is a rare visitant to the British shores; but is very abundant in warmer climates, as in the West Indies. There are several other species.

Node, in astronomy, one of the points in which two great circles of the celestial sphere, such as the ecliptic and equator, the orbit of a planet and the ecliptic, intersect each other; and also one of the points in which the orbit of a satellite intersects the plane of the orbit of its primary. The node at which a heavenly body passes to the north of the plane of reference is called the *ascending node*; that where it passes to the south is called the *descending node*. The straight line joining the nodes is called the *line of nodes*.

Node, in botany, the point of insertion of one or more leaves on a stem. The piece of stem between two nodes is an internode.

Node, in physics, a point in a vibrating body where there is no motion. A string fixed at its ends, e.g., vibrates so that these ends are nodes (see *Harmonics*). If a plate of glass or metal is supported, and a bow is drawn across the edge, particles of fine sand, strewn over the plate, will arrange themselves in lines, along which it is evident no vibration has taken place. These lines are called *nodal lines*.

Node, in geometry, a point at which a curve intersects itself, so that it has two distinct tangents at the point. A *cusp* (q.v.) is the limiting case of a node at which the two tangents are coincident. If the tangents are imaginary, the node is called a *conjugate point*.

Nodier (nod-i-ā), Charles, French writer, born 1780, died 1844. He wrote tales, romances, satires, dictionaries, travels, works on entomology, &c., was a friend of all the literary men of the time, and had a certain influence on the Romantic school of French authors, including Hugo, Dumas, and others.

Nodosa'ria, a genus of foraminifers, having a shell composed of numerous globose chambers arranged in a straight line. They occur in Carboniferous, but mostly in Mesozoic, Cainozoic, and recent deposits.

Nogi, Maresuke, Count, Japanese general, was born in Choshu, of Samurai parentage, in 1849, and committed *hara-kiri* in 1912. In his early career he saw service during the Civil War of 1877, and commanded a brigade at the battle of Kinchow (1894), and at the taking of Port Arthur from the Chinese. From 1896 to 1900 he was Governor of Taiwan (Formosa). Nogi became celebrated during the Russo-Japanese War of 1904–5, when he commanded the Third Army, which besieged Port Arthur, and eventually brought about the surrender of the city. His famous flanking movement decided the sanguinary battle of Mukden. At the conclusion of the campaign he received the Orders of the Rising Sun and Golden Kite. While the State funeral of the Emperor Mitsu Hito was in progress, the Count and Countess Nogi committed suicide in order to rejoin the master whom, throughout their lives, they had so faithfully served. With the death of the general the male line became extinct, his two sons having been killed before Port Arthur.

Noisseville (nwȧs-vēl), a village of France, in Lorraine, to the east of Metz, the scene of a fiercely contested battle during the Franco-German War, 31st Aug. and 1st Sept., 1870, between the forces of Prince Frederick Charles and those of Marshal Bazaine. The Germans were victorious.

Nola, a town of Campania, Italy, in the province of Caserta, on the railway to Bajano. Bells are said to have been first made here. It occupies the site of an Etruscan city, captured by the Romans in 313 B.C., in which the Emperor Augustus died. Pop. 12,000.

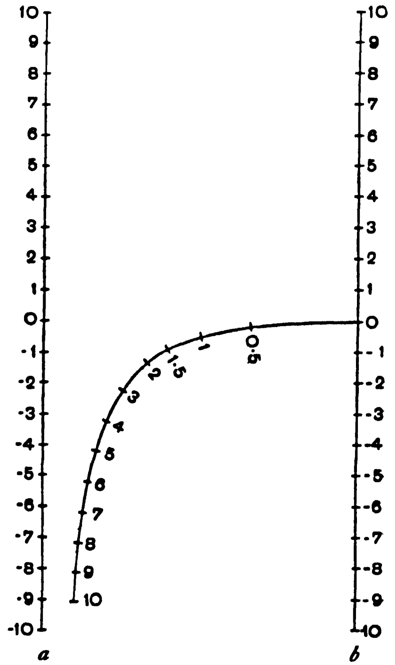
Nol'lekens, Joseph, an English sculptor, son of an Antwerp painter, born in London 1737, died 1823. He was placed early under Scheemakers, and in 1759 and 1760 gained premiums from the Society of Arts. Going subsequently to Rome, he had the honour of receiving a gold medal from the Academy of Painting and Sculpture. On his return to England in 1770 he was elected an Associate of the Royal Academy (1771) and a Royal Academician (1772). His *Venus with the Sandal* is his principal ideal production; but his professional reputation rests mainly upon his portrait busts.

Nolle Prosequi (nol'le pros'e-kwī; Lat., 'to be unwilling to prosecute'), in law, a stoppage of proceedings by a plaintiff, an acknowledgment that he has no cause of action.

Nomads, tribes without fixed habitations, generally engaged in the tending and raising of cattle, and changing their abode as necessity requires or inclination prompts. North Africa, the interior of North and South America, and the northern and middle parts of Asia are still inhabited by nomadic tribes, some of whom are little better than bands of robbers.

Nominalism, a term in scholastic philosophy designating the theory that only individual objects have real existence, whilst *universals* are nothing but names. In other words, individual concrete objects alone are real, while the genus is only a symbol, or a word. Nominalism thus meant that no interest could be taken in a world of abstractions. It was a reaction against neo-Platonism, limiting as it did man's study to what he could observe, to a world of concrete, individual objects. To a certain extent nominalism is the forerunner of positivism (q.v.). Nominalism is opposed to realism, which maintains that general ideas are not formed by the understanding, but have a real existence independent of the mind, and apart from the individual object, that, for example, beauty in the abstract has a real existence, apart from a beautiful thing. The problem, already discussed by Boethius, was revived by John Roscellinus, Canon of Compiègne, in the eleventh century. It was condemned at Soissons in 1092, and the realists became the predominating school. A reconciliation between the two opposing theories was attempted by Abelard, who taught that although ideas are not found actually existing in the objects themselves, they can yet be conceived by the mind as existing independently and apart from any concrete embodiment of them, and that accordingly they are not mere words. This doctrine was called *conceptualism*. In the beginning of the fourteenth century the dispute was again revived by the English Franciscan William of Occam, a disciple of Duns Scotus. The nominalists, although often persecuted, gradually gained the ascendancy in France as well as in Germany. See *Scholasticism*.

Nomography, a graphical method of evaluating formulæ and solving equations. Suppose that a number x is determined when the values of two other numbers a and b are given; we may have, e.g., $x = a^3b^2$, or $x^2 + ax + b = 0$. Then two straight lines A and B are graduated, not necessarily to the same scale, and, as a rule, placed parallel to each other; and a curve X is drawn and so graduated that the straight line joining the graduation a on the scale A to the graduation b on the scale B cuts the curve X at the graduation x, corresponding to the number x which is required. The illustration is a nomogram which gives the solutions between 0 and 10 of any equation of the quadratic type $x^2 + ax + b = 0$, for values of a and b from -10 to 10. If the scale on the right (b) is taken as the axis of Y, and the origin at the point 0 on that scale, the equation of the curve is $Y = -X^2/(X + 1)$, the second scale (a) being placed along the line $X = -1$. To find, e.g., the positive root of the equation $x^2 + 5x - 3 = 0$, lay a ruler across the page from $+5$ on the a scale to -3 on the b scale; the ruler will cut the curve at the graduation 0·54, which is the root required. In numerical evaluations it is often useful to have several straight scales, graduated in various ways, and perhaps not parallel to each other; in these cases several applications of the ruler are made to the diagram, according to a definite plan, and the final answer is read off one of the scales. Nomography is coming to be used rather extensively, especially in routine engineering calculations. The preliminary process of constructing a suitable nomogram may take some time, but if the number of calculations all of one type is large, it may be time well spent. The recent development of the method is chiefly due to P. M. D'Ocagne, whose *Traité de Nomographie* is the standard work on the subject.—Cf. S. Brodetsky, *A First Course in Nomography*.



Non-commissioned Officers are soldiers not holding a commission from the Crown; subordinate officers below the rank of warrant-officer, as lance-corporals, corporals, and sergeants, or as bombardiers in the artillery.

Nonconformity. Nonconformity is a general term for dissent from an Established Church. It is specially associated with English history after the Reformation, and it acquired a new and definite significance after the Restoration of 1660. The earliest Nonconformists were the 'Separatists' of the reign of Elizabeth, who met together for private worship, though many of them did not repudiate connection with the English Church. Some of these, like the Anabaptists, exercised no permanent influence upon English history; the most important were the holders of what was afterwards known as Presbyterianism, and there were also advocates of Independency, now described as Congregationalism. The word 'Puritan' was used to cover the whole movement, but it included men who would now be regarded as Low Churchmen. The refusal of James I to accept the Millenary Petition in 1603, and the failure of the Hampton Court Conference in 1604, made a permanent breach between the more extreme Puritanism and the Church of England, and the king's policy of repressing Puritanism led both to the growth of Puritan congregations in England and to Puritan emigration to the New World (see *Pilgrim Fathers*). In the reign of Charles I the religious policy of Laud drove not only Low Churchmen but also moderate Churchmen to support the Puritans, and the Presbyterians were in a majority in the House of Commons in the Long Parliament. Their influence in Parliament was, however, out of proportion to their numbers and influence throughout the country, and, after the defeat of the Royalists by Cromwell and the New Model Army, the Independents came into power, and by Pride's Purge (1648) expelled the Presbyterian majority of the House of Commons. Under the Commonwealth and Protectorate what had been Nonconformity became the Established Church, Presbyterians and Independents being alike eligible to hold livings.

After the Restoration an attempt was made to compel conformity with the Church of England, by a series of measures known as the Clarendon Code. The Corporation Act restricted office in a municipal corporation to men who took the sacrament annually in accordance with the rites of the Church of England. The effect of these measures was to create a large number of Nonconformist congregations, and in 1664 Parliament passed a Conventicle Act to prohibit any exercise of public worship outside the Church. In 1665 this was followed by the Five Mile Act, which forbade a Nonconformist minister to come within 5 miles of any market town or of any parish where he had held the living, or to teach in a school. Charles II, in 1672, issued a Declaration of Indulgence, suspending the operation of these Acts and also of the penal laws against Roman Catholics, but the Anglican Parliament forced him to withdraw the Declaration and to assent to the Test Act (1673), which, though aimed primarily against Roman Catholics, included Protestant Nonconformists in its provision that anyone who held office under the Crown should take the sacrament in the Church of England. Nonconformists had welcomed Charles's Declaration of Indulgence, but the policy of his successor, James II, alarmed them, and they joined with the Church in protesting against his Declarations of Indulgence and supported the Revolution. William III was anxious to bring about a comprehension of Nonconformists within the Church, but efforts in this direction were unsuccessful, and they had to be content with the measure of relief given by the Toleration Act (1689), which relieved them from the fines inflicted for non-attendance at their parish churches, and allowed them to worship in licensed and registered chapels. During the Tory reaction in the end of Anne's reign an Occasional Conformity Act was passed to prevent Nonconformists from qualifying for office by taking the sacrament on rare occasions, and a Schism Act to deprive them of the opportunity of educating their children in their own doctrines. Both these Acts were repealed in the reign of George I, but Walpole did not dare to propose to repeal the Corporation Act or to relieve his Nonconformist supporters from the disabilities of the Test Act. He did, however, pass in 1727 an Act which was interpreted as exempting Protestant Nonconformists from the penalty for holding office without taking the sacrament, and this Indemnity Act was passed annually until the repeal of the Test and Corporation Acts in 1828. An Act of 1836 permitted Nonconformists to solemnize marriages in chapels registered for that purpose, and in 1871 the Universities Test Acts gave them admission to the Universities of Oxford, Cambridge, and Durham.—BIBLIOGRAPHY: D. Neal, *History of the Puritans*; J. Heron, *A Short History of Puritanism*; E. Dowden, *Puritan and Anglican*.

Nonjurors, clergy and laymen who, though no Romanists, refused to take the oath of allegiance to the Government and Crown of England at the Revolution, when James II abandoned the throne. The Nonjurors numbered upward of 400 clergy, and included the Archbishop of Canterbury, William Sancroft, and several bishops. See *England* (*Ecclesiastical History*).

Nonnus, or **Nonnos**, a later Greek poet, born at Panopolis, in Egypt, who lived about the beginning of the fifth century A.D. He is the author of a poem entitled *Dionysiaca*, in forty-eight books, in which the expedition of Bacchus (Dionysus) to India is described; also of a paraphrase, in Greek hexameters, of the *Gospel of St. John*.

Nonsuit, a term in law. When a person has commenced an action, and at the trial fails in his evidence to support it, or has brought a wrong action, he is nonsuited. A nonsuited plaintiff may afterwards bring another action for the same cause, which he cannot do after a verdict against him.

Norbiton, a district of Surrey and a residential suburb of London, on the Southern Railway (London and South Western Railway section), 12 miles from London.

Norbury, a district of Surrey and a residential suburb of London, on the London, Brighton, & South Coast Railway and the Metropolitan tramway system, 7 miles from London.

Nord, a department in the north-east of France, bordering with Belgium; area, 2170 sq. miles. The coast, marked by a long chain of sandy hillocks, furnishes the two harbours of Dunkirk and Gravelines. The interior is a fertile alluvial flat, intersected by sluggish streams and canals. The principal minerals are coal and iron, which were extensively wrought, the occupations connected with or depending on them rendering this department among the most important in France prior to the European War. The capital is Lille. The mineral industry was totally destroyed during the war, and the greater part of Nord was occupied and devastated by the Germans. Pop. (1921), 1,788,518.

Nordau, Max Simon, German - Hungarian author and prominent Zionist leader, born at Budapest 29th July, 1849. The son of a Jewish rabbi, he studied medicine, travelled extensively throughout Europe, and then practised as a physician at Budapest in 1878 and at Paris in 1880, settling permanently at the latter place. His publications, which include books of travel, essays, novels, plays, and poems, are in the main a revolt against religious, social, moral, and political conventions, which he characterizes as signs of degeneration. His more important works are: *The Conventional Lies of Civilization*, *Paradoxes*, *The Disease of the Century*, *Degeneration*, *The Drones must Die*, *Morganatic*, *On Art and Artists*, *Zionism*, *The Interpretation of History*. He died in 1923.

Nordenskiöld (nor'den-sheuld), Nils Adolf Erik, Baron, a Swedish naturalist and explorer, born at Helsingfors 18th Nov., 1832, died at Stockholm 12th Aug., 1901. He devoted himself to science, and was appointed to some important posts, but becoming obnoxious to the Russian authorities he settled in Sweden. He made geological discoveries in Spitzbergen, and took part in all Arctic expeditions sent out by the Swedish Government. On a North Polar expedition in 1868 he reached the high latitude of 81° 42′. Having turned his attention to Siberia, after making two successful voyages through the Kara Sea to the Yenissei, he decided to attempt the accomplishment of the north-east passage, or passage by sea round Northern Asia to the Pacific. Aided by the King of Sweden and others, Nordenskiöld was enabled, July, 1878, to sail in the *Vega*, which was the first vessel to double the most northern point of the Old World, Cape Tchelyuskin, and after passing through Behring's Straits reached Japan, 2nd Sept., 1879.

Norderney, a small island belonging to Prussia, province of Hanover, on the coast of East Friesland: area, about 5 sq. miles; pop. 4000, chiefly fishermen of the old Frisian stock.

Nordhausen (nord'hou-zn), a town of Germany, in the Prussian province of Saxony, on the Zorge and on the slopes of the Harz Mountains. It has a Roman Catholic cathedral and an old town house. It manufactures lacquerware, chemicals, &c.; and has extensive distilleries and breweries. Pop. 32,500.

Nördlingen (neurd'ling-en), a walled town in the Republic of Bavaria, on the Eger, near the Württemberg frontier, with well-preserved wall and towers, and a Gothic church (St. George) surmounted by a tower 345 feet high. It has manufactures of carpets, woollen and linen goods, leather, &c. In the Thirty Years' War the Swedes were defeated here, 6th Sept., 1634, by the Imperialists, and on 3rd Aug., 1645, the French under Condé and Turenne defeated the Imperialists under Franz von Mercy. Pop. 9000.

Nordstrand, an island of Germany, on the west coast of Schleswig; area, 21 sq. miles. The greater part of it was swept away in 1634 by a flood, which drowned 15,000 persons. Pop. about 2500 Frisians by origin.

Nore, (1) a part of the estuary of the Thames, about 50 miles below London, and east of Sheerness, encumbered with sand-banks. On the eastern side the Nore lightship has been anchored since 1792.—(2) A river of Ireland, rising in the Slieve Bloom Mountains, on the borders of Tipperary and Queen's County, and joining the Barrow about 2 miles above New Ross; length, 70 miles. It admits vessels of considerable size as far as Inistioge (10 miles), and barges to Thomastown.

Norfolk (nor'fok), a maritime county of Eastern England, with 90 miles of seaboard to the North Sea; area, 1,315,064 acres, or about 2054 sq. miles. The surface is generally flat, with some slight swells and depressions in the north part. The coast consists principally of cliffs, partly chalk and partly alternate strata of clay, gravel, loam, and sand. These are gradually being undermined by the sea, which is in many places making inroads on the land. The principal rivers are the Yare, in the east, with its affluents the Bure, the Wensum, and the Waveney; and the Ouse, in the west, with its feeders the Little Ouse, the Wissey, &c. The Yare and its tributaries expand near the sea into meres or *broads*, which, largely covered with bulrushes and sedges, are the resort of a great variety of water-fowl. The county is served by the Great Eastern Railway and a Midland-Great Northern joint line. It is noted for agricultural progressiveness, barley (mainly for malting), wheat, and oats being raised, and dairying and fruit-growing practised. The manufactures consist chiefly of woven goods. Norfolk has extensive fisheries of both herrings and mackerel. Oil-shale is worked in the King's Lynn district. Five members are returned to Parliament. The county town is Norwich; the chief seaport is Yarmouth. Pop. (1921), 504,277.

Norfolk was occupied in early times by the Iceni, and several stations were founded by the Romans. It became part of East Anglia, and eventually became one of the richest areas of England through its wool-producing industry.—Cf. W. Rye, *History of Norfolk*.

Norfolk, a city and port of entry of Norfolk county, Virginia, United States, on the Elizabeth River (an arm of Chesapeake Bay), and served by the Chesapeake & Ohio, the Southern, the Norfolk & Western, the Virginian, and other railways, and by many steamship lines. It is an important United States naval station, with constructive and repairing establishments, and is the second largest city of Virginia state. Much cotton is exported, with peanuts, coal, grain, fruit, and oysters. Norfolk was founded in 1682, incorporated in 1786, and became a city in 1845. Pop. (1920), 155,777.

Norfolk Island, an island of the Southern Pacific, in 29° 8′ 4″ s. lat., 167° 58′ 6″ E. long., described as 'the Madeira of the Pacific'. It is 930 miles distant from Sydney (New South Wales); the coast-line is 20 miles; except on the south-west, inaccessible cliffs rise from the sea. The climate is equable, ranging from 56° to 82°, with a mean of 68°. Bananas and (in parts) coffee, oranges, lemons, guavas, pineapples, and passion fruit are raised. Butter is produced. Cattle, horses, sheep, pigs, and poultry are reared. Schools of whales (sperm and hump-backed) visit Norfolk Island annually, and edible fish abound in the surrounding waters. Exports are mainly lemon-peel, lemon-juice, and hides. The 'All-Red' cable from Great Britain, via Vancouver, Fanning Island, and Fiji, bifurcates at Norfolk for New Zealand and Brisbane respectively. Education is free and compulsory up to fifteen years. Area, 8528 acres (5 miles long by 3 miles wide); pop. (1920), 740, 340 being males.

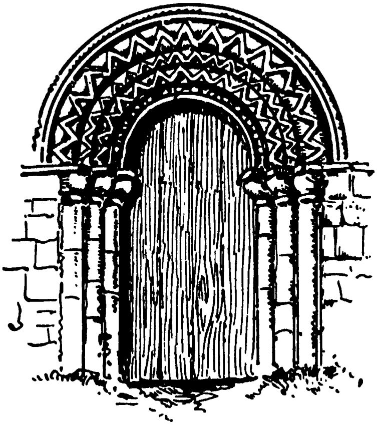
Norfolk Island was first colonized in 1788 by H.M.S. *Sirius*, a small penal settlement being established at Port Jackson. The descendants of the *Bounty* mutineers became too numerous to subsist on Pitcairn Island, and were removed thence to Norfolk Island (1856). In 1856 the island was severed from Tasmania, and is now administered (since 1st July, 1914) from Melbourne through an Administrator and Chief Magistrate.

Norfolk Island Pine, a tree of the genus Araucaria (*A. excelsa*), nat. ord. Coniferæ, formerly abounding on Norfolk Island, where it attains a height of 200 feet or more, with a diameter of 10 or 11 feet. Its timber is valuable, being white, tough, and close-grained. It does not thrive in the open air in Britain, but grows remarkably well in conservatories, and is one of the most beautiful of trees. Though an Araucaria, it is very unlike the common species (*A. imbricāta*).

Noria, see *Persian Wheel*.

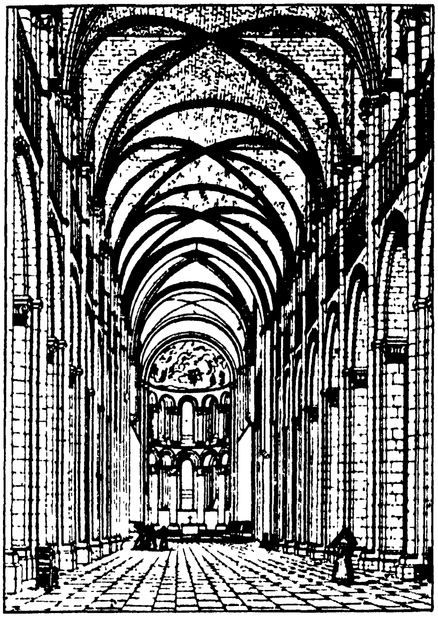
Nor'icum, a province of the Roman Empire, south of the Danube, and corresponding generally to modern Carinthia and Styria, with parts of Bavaria and Austria. The original inhabitants were Celtic, and were subdued by the Romans in 14–16 B.C.

Norman Architecture, the round-arched style of architecture, a variety of the Romanesque, introduced at the Norman Conquest from France into Britain, where it prevailed till the end of the twelfth century. In its earlier stages it is plain and massive with but few mouldings, and those principally confined to small features; as the style advanced greater lightness and enrichment were introduced, and some of the later examples are highly enriched. The chevron, billet, nail-head, and lozenge mouldings are distinctively characteristic of this style. The more specific characteristics of churches in this style are: cruciform plan with apse and apsidal

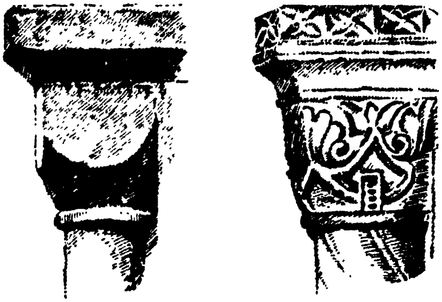


Norman Doorway, Castle Rising, Norfolk

chapels, the tower rising from the intersection of nave and transept; semi-cylindrical vaulting; the doorways, deeply recessed, with highly decorated mouldings; the windows small, round-headed, placed high in the wall, and opening with a wide splay inside; piers massive, generally cylindrical or octagonal, and sometimes enriched with shafts; capitals cushion-shaped, sometimes plain, more frequently enriched; buttresses broad, with but small projection; walls frequently decorated by bands of arcades with single or interlacing arches. In course of time the arches began to assume the pointed character; the piers, walls, &c., to be less massive; short pyramidal spires crown the towers; and altogether the style assumes a more delicate and refined character, passing gradually into the Early English. Besides ecclesiastical buildings, the Normans reared many castellated structures, the best remaining specimen of which is the Keep of the Tower of London. The walls of Norman buildings were of great thickness, and the piers supporting their arches were usually of immense girth, yet notwithstanding this massiveness the buildings frequently gave way. The Abbaye aux Hommes and the Abbaye aux Dames at Caen, Normandy, afford excellent examples of this style; as also parts of the cathedrals of Durham, Peterborough, Norwich, and Canterbury, as well as many smaller churches. —Cf. E. G. Browne, *Norman Architecture*.



Norman Architecture—Abbaye aux Dames, Caen



Norman Capitals.

Left, from Buckland Church, Berks. Right, Hanney Church, Berks.

Norman Conquest. The battle of Hastings (or Senlac), by which William of Normandy became an English king in 1066, was the culmination, not the beginning, of a process of Normanization. Edward the Confessor, the last monarch of the House of Wessex, was the son of Emma of Normandy, and had been brought up by his mother's kinsfolk while Canute (Emma's second husband) was reigning in England. After his accession, in 1042, Edward set himself to introduce Norman manners and customs into England; he was surrounded by Norman courtiers and ecclesiastics, and he wished his cousin, William, Duke of Normandy, to succeed him. The king had to face the powerful opposition of Godwin, Earl of Kent, and, after his (Godwin's) death in 1053, of his son Harold, both leaders of an English party. In the year preceding Edward's death, Harold was shipwrecked on the Norman coast, and was compelled to take an oath to acknowledge William's claim, but when the Confessor died, the Witan, or Great Council, chose Harold as his successor, and he was crowned on 6th Jan., 1066. William at once began to prepare to invade England, and Harold had also to meet a Danish invasion, assisted by one of his own brothers. He defeated the Danes at Stamford Bridge on 25th Sept., but the Norman attack immediately followed, and Harold had to lead a tired army from Northumbria to Sussex to fight the new enemy. The battle (14th Oct.), fought on a hill then known as Senlac, about 8 miles from Hastings, was fiercely contested, but resulted in a complete Norman victory, and Harold was killed. The city of London at first was opposed to the Conqueror, but he devastated and laid waste all south-eastern England until the Londoners were convinced of the hopeless-ness of the English cause, and they submitted in December. William the Claimant (as he described himself) was crowned in Westminster Abbey on Christmas Day, 1066, as the lawful successor of the old English kings, and he promised to retain the law of England. None the less, the Norman Conquest marked a great turning-point in English history, and was followed by fundamental changes in law and in organization. As different parts of the country fell successively under his power, William distributed the land among his own followers, and English society became divided into a ruling class of Norman land-owners and a subject class of English, a distinction which, within about a century, was obliterated by inter-marriage. Anglo-Saxon England had been developing in the direction of feudalism, and the process was accelerated by the introduction of Continental feudalism, with, however, some important limitations to the power of the feudal barons. The most important results of the Conquest were the unification of England under a strong absolute monarchy, and the introduction of Norman financial and legal methods and institutions—among them the jury, first employed as a financial expedient, and used for the compilation of *Domesday Book*, William's famous survey of the land and live-stock of the country. *Domesday Book* was regarded as a great grievance by the English, as were also the forests which the Norman kings created for their hunting. From 1066 until the reign of John, England was closely associated with the Duchy of Normandy, and one portion of the old duchy—the Channel Islands—still belongs to the English Crown.

Nor'mandy, a pre-Revolutionary province of France, now divided into the departments of Seine-Inférieure, Eure, Orne, Calvados, and Manche. The name, however, is still applied to the whole district. It lies along the English Channel; Rouen is the capital. On the decline of the Roman Empire Normandy was seized by the Franks, and afterwards, in the tenth century, wrested from them by the Normans or Northmen, from whom it received its name. Charles the Simple gave his sanction to the conquest made by the Normans, and Rollo, their chief, received the title of Duke of Normandy. William the Bastard, sixth in succession from Rollo, having become King of England in 1066, Normandy became annexed thereto. On the death of William it was separated from England and ruled by his son Robert, and was afterwards ruled by the kings of England until Philip Augustus wrested it from John and united it to France in 1203. Although several times invaded by the English, it was finally recovered by the French in 1450. It was divided up in 1791.—Cf. A. Albert-Petit, *Histoire de Normandie.*

Norman French, a dialect of old French which became the Anglo-Norman of England. It was the language of legal procedure in England till the time of Edward III, and is still used in several formal proceedings of state.

Normans (literally 'north-men'), the descendants of the Northmen who established themselves in Northern France, hence called Normandy. Besides the important place occupied in history by the Normans in Normandy and England, bands of Normans established themselves in Southern Italy and Sicily, and Norman princes ruled there from the middle of the eleventh till the end of the twelfth century.

Nor'manton, a town in the West Riding of Yorkshire, on the Calder, and an important railway junction of the Midland, the North-Eastern, and the Lancashire and Yorkshire systems. Pop. (1921), 15,858.

Norns, in Scandinavian mythology, the three Fates, representing the *past*, the *present*, and the *future*, whose decrees were irrevocable. They were represented as three young women, named respectively Urd, Verdandi, and Skuld.

Norristown, a borough and city of Pennsylvania, United States, county seat of Montgomery county, on the Schuylkill; served by the Pennsylvania and other railways, by electric railway to Philadelphia, and by the Schuylkill Canal. Norristown was founded in 1785, and was incorporated as a borough in 1812. It has extensive woollen- and cotton-factories, rolling-mills, foundries, &c. Pop. (1911), 27,875.

Norrköping (nor-cheup'ing), a town of Sweden (founded in 1384), at the mouth of the Motala Elf in the Bravik, a gulf of the Baltic. The Motala Elf flows through the town, making several falls within it, and is crossed by several bridges. It has manufactures of woollens, cottons, &c., and has sugar-refineries and shipbuilding yards. Pop. (1920), 57,377.

Norte (nor'tā), Rio Grande del, a river of North America, forming for a long distance the boundary between Mexico and the United States, and falling into the Gulf of Mexico. Length, about 2000 miles.

North, Frederick, Lord, Earl of Guilford, the eldest son of Francis, first Earl of Guilford, born in 1732, died 1792. He is best known as having been the chief of the administration during the American War of Independence. In 1770 he succeeded the Duke of Grafton as minister, when his retention of the tea-duty, imposed upon the American colonists, led to the rising in America, and to the declaration of independence, 4th July, 1776. Lord North resigned on the 20th of March, 1782. He became Earl of Guilford by the death of his father in 1790.

North, one of the cardinal points, being that point of the compass which is exactly in the direction of the North Pole. In the case of the celestial sphere, north means the direction towards the North Pole of the heavens. See *Pole.*

Northallerton, a town of England, capital of the North Riding of Yorkshire; served by the North-Eastern Railway. The industries include some tanning and currying, brewing, malting, engineering, and saddlery-making. Three miles outside the town, on the north, was fought the battle of the Standard (1138). Pop. (1921), 7635.

North America, the northern half of the Western Continent or New World, extending northwards from Mexico, which it includes, and embraces also the United States, Canada, and Alaska. The total area is about 8,200,000 sq. miles, and the pop. approximately 134,000,000. See *Geography* (under *Land Forms*); *America*; and articles under various countries.

Northamp'ton, a county and municipal borough of England, county town of Northamptonshire, on the Nene; served by the Midland and the London & North-Western Railways. Northampton has four noteworthy parish churches, viz. St. Giles, St. Peter's, All Saints, and St. Sepulchre, one of the three round churches of England. There is a Roman Catholic cathedral. The staple manufacture is boots and shoes for home and export trade. There are also iron- and brass-foundries, breweries, corn-mills, &c. Ironstone is found in the neighbourhood, and smelting-furnaces are at work. Northampton sends one member to Parliament. Pop. (1921), 90,923.

Northampton, an inland county of Eastern England; area, 585,148 acres, or about 998 sq. miles. The county is pleasantly diversified by low hills, extensive woodlands watered by numerous rivers and streams, the chief of them being the Welland, Nene, Avon, and Cherwell. The county is traversed by the Midland, Great Central, London & North-Western, and the Great Northern Railways, and by the Grand Union and other canals. The principal grain crops are wheat, barley, and oats. The rearing of sheep and cattle is a principal object with the Northamptonshire farmers. Northamptonshire is a famous hunting county. For administrative purposes there are two counties and two county councils. Northamptonshire sends four members to Parliament. Pop. (1921), 302,430.

Northampton, a city of Massachusetts, United States, the county seat of Hampshire county, on Connecticut River; served by the New York, New Haven, & Hartford, and the Boston & Maine Railroads. Cutlery, brushes, paper, cotton, and woollen goods are manufactured. Pop. (1920), 21,951.

Northbrook, Thomas George Baring, Earl of, English statesman, son of the first Baron Northbrook, born in 1826, died in 1904. After holding various important offices, he became Viceroy of India in 1872. This office he resigned in 1876, and was created Earl of Northbrook. From 1880 to 1885 Lord Northbrook was First Lord of the Admiralty under Gladstone; but in 1886 he opposed the Home Rule policy of the premier.

Northcote, James, born in Plymouth in 1746, died 1831. He studied art under Sir Joshua Reynolds, became highly successful as a portrait-painter, and won both wealth and reputation. Two of his best works were for the Shakespeare Gallery—the *Murder of the two Princes in the Tower* and *Hubert and Arthur.* He published *Memoirs of Sir Joshua Reynolds,* comprising *Anecdotes of his Contemporaries* (1813), and a *Supplement* (in 1815); and *Memoirs of Titian* (1830), in which he was assisted by Hazlitt.

North-east Passage, a passage for ships along the northern coasts of Europe and Asia to the Pacific Ocean, formerly supposed likely to be of commercial value. The first to make the complete voyage by this passage was the Swedish explorer Nordenskiöld (in 1878–9), after it had been attempted in vain by Englishmen and Dutchmen for upwards of three centuries.

Northern Mythology, the mythology of the Scandinavian peoples inhabiting Denmark, Norway, Sweden, and Iceland. According to the Scandinavian mythical cosmogony there were originally no heavens above nor earth below, but only a bottomless deep (*Ginungagap*), north of which was a world of mist (*Niflheim*), and south of which was the world of light or fire (*Muspelheim*). A warm wind blowing from the latter upon the ice of Niflheim melted it, and from the drops sprang Ymir, the ice-giant. Ymir was fed by the cow Audhumbla, who had a similar origin. As she was one day licking blocks of ice, human hair grew out of them, and then an entire man, called Buri. His son was Bor, who had three sons, Odin, Vili, and Ve, who became the rulers of heaven and earth. The children of Bor were good, those of Ymir wicked; and they were constantly at war with each other. The sons of Bor finally slew the ice-giant, dragged his body into the deep, and from it created the world. Out of two trees Odin, Vili, and Ve created a man, called Askur, and a woman, Embla. The earth was supported by a large ash, called Ygdrasil, whose branches extend over the world, while its top reaches above the heaven. The residence of the gods was Asgard, whence the bridge Bifröst led to the earth. The giants dwelt in Jötunheim or Utigard, and men in Midgard. As in Greek mythology there was an older and a newer dynasty of the gods. The ancient and modern systems seem to have their connecting-point in Odin, as with

Zeus in the Greek system. Aesir or Aser is the name for the new race of gods. They are Odin, or Woden, the god of gods, the *Alfadur* (All-father), who lives for ever; from him and his wife Frigga are descended the other gods. Among their sons are Thor, god of thunder, the strongest of gods and mortals, whose hammer, Miölnir, crushes the hardest objects, and Baldur, the youthful and beautiful god of eloquence. Niord is the god of winds, of sailors, of commerce, and of riches; his son Frei is the ruler of the sun, and upon him depend rain and sunshine, plenty or dearth. Freya is the goddess of love. The mildest and most bountiful of the gods, she is a friend of sweet song, and loves to hear the prayers of mortals. Tyr, a son of Odin, the fearless god, who wounds by a look, is lofty as a fir, and brandishes the lightnings of battle. He is not properly the god of war, but rather of power and valour. His brother Braga is the god of wisdom and poetry. Braga's wife is Iduna, who preserves the apples of immortality, which she offers in vessels of gold to the heroes at their entrance into Valhalla. The Valkyries or 'choosers of the slain' are awful and beautiful beings, neither daughters of heaven nor of hell. Mounted on swift horses, they conducted the heroes to Valhalla. Another striking figure is Loki, as beautiful as he is malignant. By the giantess Angerbode he had Hela, the goddess of the lower regions, the wolf Fenrir, and the terrible serpent of Midgard, Jormungandur, which surrounds the whole earth. Hela rules in Niflheim. All who die of sickness and old age, and not in war, descend to her dark mansion. Other mythical personages were the Norns or fates, and Heimdall, who keeps watch on the bridge Bifröst. According to the popular belief the world and all the gods were destined to finally perish in a final crash of doom, the 'twilight of the gods'.—BIBLIOGRAPHY: H. A. Guerber, *Myths of the Norsemen*; F. Kauffmann, *Northern Mythology*.

Northern Territory, a region of Australia, comprising all land lying between the meridians of 129° and 138° E. long., and north of the line of 26° S. lat., which divides it from South Australia. The area is 523,620 sq. miles, the length from north to south being about 900 miles, and the breadth, east to west, 560 miles. There is a coast-line of about 1040 miles (or 508 sq. miles of area to 1 mile of coast-line). With the exception of a strip 2½° wide lying south of the Tropic of Capricorn, the territory is entirely within the Torrid Zone. The low, flat coast-line seldom reaches a height of 100 feet, and sandy beaches, thickly fringed with mangroves, prevail. There are numerous rivers, many of which are navigable for considerable distances from their estuaries. From the coast there is a general rise southwards to the 17th or 18th parallel of S. lat., where the higher lands form the water-shed between the rivers that flow northwards to the sea and those that form the scanty supply of the interior systems. Towards the centre of the continent the land over a wide area is of considerable elevation, and there are several mountain ranges with an east and west trend.

Climate and Fauna.—Between May and October there is a dry season; the wet season lasts from November until April. The white ant is a pest; mosquitoes and sand-flies are troublesome during the wet season; marsupials, birds, crocodiles, freshwater tortoises, snakes, freshwater fish, and littoral mollusca are abundant.

Social Conditions.—The Australian aborigines located in the territory are believed to number 20,000, and include the tribes of Larakaya, Worgait (at Port Darwin), Melville Island, Port Essington, Djanan (at Katherine Creek), Yangman (at Elsey Creek), Mungarai (upper part of Roper River), Mara (south of Roper River), and Nullakun (middle Roper River). A Protector of Aboriginals, resident at Darwin, is entrusted with their care. They are nomadic, have no settled industry, do not cultivate the land, and are healthy in their natural state, but rapidly fall into disease through drink and opium when brought into contact with new settlers. Aboriginal Reserves (1920) cover an area of 33,000 sq. miles.

The total population (excluding aborigines) is (1920) 3992, of which 2911 are males.

Communications.—The territory is dependent for shipping facilities chiefly on two vessels trading between Sydney and Singapore, and there is also a quarterly service between Freemantle and Darwin. The Commonwealth is to construct the Northern Territory portion of the trunk line connecting Adelaide and Darwin via Port Augusta. A line runs from Darwin to Katherine (200 miles, 3-foot-6-inch gauge), and the line to connect Katherine River with Oodnadatta (South Australia, 1000 miles) has been surveyed. Another line connects Oodnadatta with Port Augusta. The transcontinental telegraph line (2230 miles) was completed on 22nd Aug., 1872, and connects Adelaide with Darwin, whence telegraphic communication is provided with Asia and Europe via Banjoewangie (Java), Singapore, and Madras. The submarine cable is duplicated between Darwin and Banjoewangie.

Production.—Herds of wild buffaloes are found on the mainland and on Melville Island, and are descendants of swamp buffaloes, but have been much depleted by shooting, 4000 hides per annum having been exported during the twenty-five years ending 1911. Buffalo milk is twice as rich in butter-fat as ordinary cow's milk, and the flesh of the animal is remarkably free from disease; but the dairying industry is undeveloped, although butter of good quality can be made, and fresh milk is procurable in Darwin from the Government dairy. An extensive meat-packing factory exists near Darwin. Agriculture is undeveloped, but rice, maize, cow-peas, sorghum, amber-cane, millets, and sugar-cane can be raised. Purely tropical products, as cotton, tea, coffee, sisal-hemp, and cigar tobacco, can flourish, but are out of the question, as cheap labour is unprocurable. There are Government cattle-stations. Gold (alluvial and reef), tin, copper, wolfram, and salt are found. Mother-of-pearl has been worked in the harbour of Port Darwin since 1884, employs eleven boats (30th June, 1920), and produces about 80 tons of pearl shell per annum. Bêche-de-mer is also exported, and the territorial waters abound in marketable fish.

History and Government.—Upon the extension of New South Wales westward to the 129th meridian (1827) the Northern Territory was comprised within that colony, and was annexed (1863) by Royal Letters Patent to the province of South Australia. On 1st Jan., 1911, it was transferred, with adjacent islands, to the Commonwealth, and is now administered by the Federal Government. There is a Resident Administrator vested with supreme authority in internal affairs, and it is proposed to grant representation in the Federal Parliament under the terms of Section 122 of the Commonwealth Constitution.

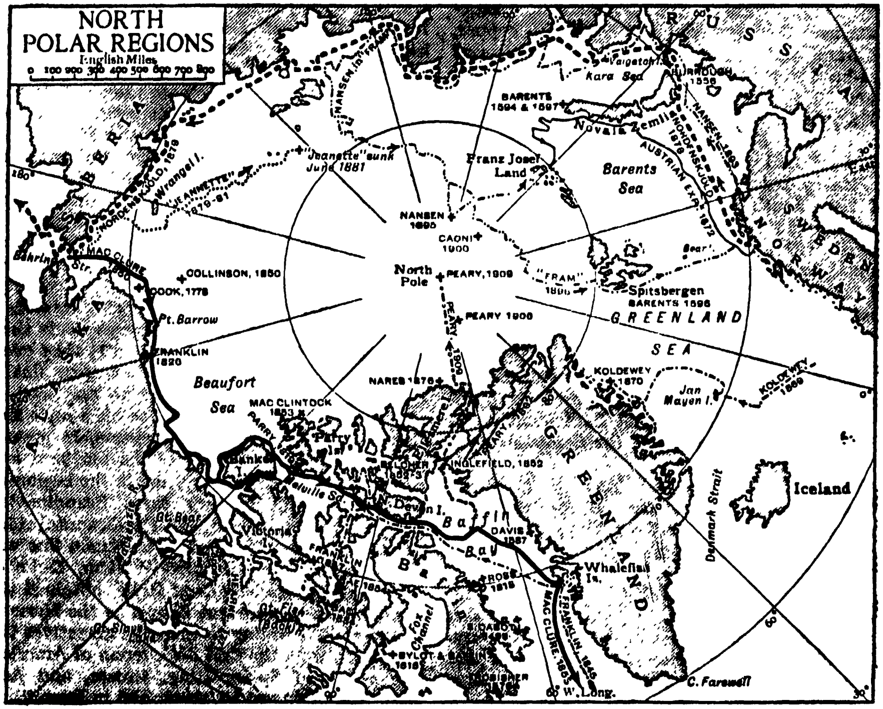
Bibliography: *Official Year Book of the Commonwealth of Australia*; B. Spencer, *The Native Tribes of the Northern Territory of Australia*; G. White, *Thirty Years in Tropical Australia.*

Northfleet, an urban district of Kent, England, on the Thames, adjoining Gravesend; served by the South-Eastern & Chatham Railway. Shipbuilding and the manufacture of paper and chemicals are the principal industries. Pop. 14,300.

North Island, the northernmost island of the Dominion of New Zealand. It contains the largest cities, Wellington (city pop. 1921, 75,496) and Auckland (city pop. 1921, 68,888). In 1920, 1269 miles of State railway traversed the state, connecting Wellington with Auckland, Napier, New Plymouth, and other towns. The east and south-east of North Island is devoted to sheep-raising, and the south-west specializes in dairying. The northern division has a progressive fruit-farming industry. There are four provincial districts, viz. Auckland, Wellington, Hawke's Bay, and Taranaki. Area, 44,180 sq. miles; pop. about 660,000. See *New Zealand.*

Northmen, the inhabitants of ancient Scandinavia, or Norway, Sweden, and Denmark, who in England were also called *Danes.* They were fierce and warlike tribes, who as early as the eighth century made piratical expeditions to all parts of the European seas, these piratical robbers being known among themselves as *vikings.* In A.D. 795 the Scandinavians established themselves in the Faröe Isles and in Orkney; towards the middle of the ninth century they founded the governments of Novgorod and of Kiev, in Russia; and after the discovery of Iceland certain powerful Norwegian families, taking refuge from the persecutions of Harold, King of Denmark, settled in that island (in 870). In the ninth century they made repeated incursions into France, and it became necessary to purchase their withdrawal with gold. Bands of them settled permanently in France, and Charles the Simple was obliged (912) to cede to them the province afterwards called *Normandy*, and to give his daughter in marriage to Rollo, their chief. Rollo embraced the Christian religion and became the first Duke of Normandy. The course of events was somewhat similar in England. Egbert, in the beginning of the ninth century, had no sooner made some approaches towards a regular government than the Danes made their appearance. Under Alfred (871–901) they overran great parts of England, but were finally defeated, and those of them who remained in the country had to acknowledge his sway. But they returned, under his successors, in greater force, obtained possession of the northern and eastern part of the country, and in the beginning of the eleventh century three Scandinavian princes (Canute, Harold, and Hardicanute) ruled successively over England. The Saxon line was then restored; but in 1066 William, Duke of Normandy, a descendant of Rollo, obtained the English throne, an event known as the Norman Conquest. According to the Saga narratives the Northmen were the first discoverers of America. The coasts of Spain, Italy, Greece, and Asia Minor were ravaged by them, and in Byzantium the body-guard of the emperors long consisted of Northmen known as *Varangians*, being recruited chiefly from those who had established themselves in Russia.—Cf. E. A. Freeman, *History of the Norman Conquest.*

North Polar Expeditions, expeditions of discovery in the Arctic regions. In 1517 Sebastian Cabot was commissioned by Henry VIII to search for a north-west passage round America to India; and from that time onwards the discovery of such a passage became a favourite project with explorers. Frobisher, Davis, Hudson, Bylot, and Baffin successively engaged in this enterprise. Then after a lapse of nearly two centuries the record of Arctic research was taken up by such men as Ross and Parry (1818), who were followed by Sir John Franklin. Franklin set sail in command of the *Erebus* and *Terror* in May, 1845, and by the month of July reached Whalefish Islands in Davis' Strait. On the 26th of that month the ships were seen in lat. 74° 48′ N., long. 66° 18′ W.; after which no further intelligence concerning them was received. It was not, however, till the beginning of 1847 that serious apprehensions were entertained regarding the expedition. The most strenuous efforts were then made by both the English and the Americans to obtain tidings of Franklin. Among the numerous expeditions sent out by sea and land in search of the missing navigator and his company were those of Richardson and Rae (by land, 1847), of Moore (1848–52), of Kellet (1848–50), of Shedden (1848–50), of Sir James Ross (1848–9), of Saunders (1849–50), of Austin and Ommaney (1850–1), and of Penny (1850–1). In 1850 MacClure set out by Behring Strait on a search expedition, and to him is due the honour of having ascertained the existence of the long-sought-for north-west passage. Other expeditions between 1850 and 1855 were: Collinson's, Rae's, Kennedy's, Maguire's, Belcher's, MacClintock's, and Inglefield's. In 1853 Rae, proceeding to the east side of King William Sound, obtained the first tidings of the destruction of Franklin's ships. In 1855 Anderson, proceeding up the Great Fish River, also discovered relics of the *Erebus* and *Terror*. At length MacClintock (1857–9) set all doubts at rest regarding the fate of Sir John Franklin and his companions by establishing the fact that they had died in 1847.



Map of the North Polar Regions, showing the Routes of the Chief Expeditions of Discovery

Dr. Kane made some important observations during the progress of his Arctic explorations, 1853–5. Then followed the expeditions of Dr. Isaac Hayes in 1860 and 1869, and those of Captain Charles Hall in 1860 and 1864.

Similarly efforts were also made to discover a north-east passage to the Pacific Ocean. In 1553 Willoughby rounded North Cape; in 1556 Burrough reached the south point of Novaya Zemlia and Waigatch Island; in 1580 Pet and Jackman penetrated into the Sea of Kara; in 1594–6 Barents discovered Bear Island and Spitsbergen, and rounded the east point of Novaya Zemlia. Dashnef in 1648 discovered Behring Strait, which was rediscovered in 1728 by

Behring, whose name it bears. A more correct idea of the configuration of the coast on either side of Behring Sea was first obtained by Cook in 1778; but with the exception of this, to the Russians is due nearly all the credit, until recently, of the explorations on the North Asiatic coasts. The north-east passage was at last accomplished by Professor Nordenskiöld (q.v.), of Sweden, who in 1878 sailed eastward along the whole of the north coast of Europe and Asia, emerging through Behring Strait early in 1879.

The northern portion of the American continent, in the region of the Coppermine River, was first explored by Hearne in 1771. In 1789 Mackenzie discovered the great river called after him. The north coast eastwards to the Great Fish River was explored by Franklin, Richardson, and Back in two expeditions by land, the first from 1819 to 1821, and the second from 1825 to 1826, while in 1834–5 Back in company with King proceeded down the Back or Great Fish River. Since then much has been done in exploring Northern Canada, though much still remains undone.

Recent expeditions have generally been with the object of getting as near the pole as possible. The Germans sent out their first expedition to the Polar regions in 1868 under Captain Koldewey, and a second in 1869 under the same captain. An Austrian expedition under the conduct of Lieutenants Payer and Weyprecht, dispatched in June, 1872, discovered Franz-Joseph Land, to the north of Novaya Zemlia. In 1875 Britain sent out an expedition under Captain Nares; it went up the west side of Greenland and returned in Oct., 1876. One of its sledge-parties reached 83° 20′ N. lat., the second highest latitude then attained. Among later expeditions were that of the unfortunate *Jeanette* (1879), sent out under the command of Lieutenant De Long, to explore the Arctic Sea through Behring Strait; and the expedition sent out by the United States under Lieutenant Greely (1881–4), which reached the latitude of 83° 24′ N., but suffered greatly from famine. Dr. Nansen, starting in 1893, reached 86° 14′ N. lat., surpassing all previous explorers. Commander Peary did splendid work in North Greenland and elsewhere. In 1909 he put forward a claim to have reached the pole, a feat in which another American, Dr. Cook, claimed to have preceded him in 1908.—Cf. A. W. Greely, *Handbook of Polar Discoveries*.

North Sea, a large branch of the Atlantic Ocean lying between Great Britain and the continent of Europe, having the former and the Orkney and Shetland Islands on the west; Denmark and part of Norway on the east; Strait of Dover, part of France, Belgium, Holland, and Germany on the south; and the Northern Ocean on the north. Extreme length, from the Strait of Dover to Unst, the most northern of the Shetland Isles, about 700 miles; greatest breadth, between Haddingtonshire, Scotland, and Denmark, about 420 miles; area, 190,000 sq. miles. The North Sea is deepest on the Norwegian side, where the soundings give over 190 fathoms; but its mean depth is no more than 31 fathoms. The bed of this sea is traversed by several submarine ridges, such as the Dogger, Jutland, and Great Fisher Banks. The shores of the sea present numerous estuaries and other inlets, and are studded with important towns, the sea being the highway for an immense maritime traffic. The fisheries, especially of herring, cod, ling, haddock, flat-fish, &c., are exceedingly valuable. See *Lofoden Islands*.

North Star, the north polar star, the star α of the constellation Ursa Minor, which is close to the true pole. As its altitude above the horizon, when certain corrections are applied, gives the latitude of a place, it is of great importance to navigators in the northern hemisphere.

Northum′berland, a northern maritime county of England, bounded south and south-west by the counties of Durham and Cumberland; east by the North Sea; and north and north-west by Scotland. Area, 1,291,515 acres, of which about 717,000 acres are arable, meadow, and pasture. The highest hills, the Cheviots, on the north-west border, towards Scotland, are admirably suited for pasture-lands. The county is watered by the Tyne, Wansbeck, Blyth, Coquet, Aln, and Till. Coal-measures occupy an area of 180 sq. miles, and yield immense quantities of coal; lead, iron, limestone, and freestone are also wrought. Arable and stock husbandry are both prosecuted with success, and the short-horned cattle mostly reared are much prized. The chief industries include shipbuilding and rope-making; forges, foundries, iron-, hardware-, and machine-works, chemical-works, potteries, glassworks, &c. The coast abounds in cod, ling, haddock, and a variety of other fishes. Northumberland returns three members to Parliament. Principal towns: Newcastle, Tynemouth, Shields, Morpeth, and Alnwick. Pop. (1921), 746,138.—Cf. J. E. Morris, *Northumberland*.

Northum′bria, one of the seven Saxon kingdoms of Britain, which extended from the Humber to the Forth, and was bounded on the west by the Kingdoms of Strathclyde and Cumbria. It was founded by Ida, an Anglian chief, in A.D. 547, and at first extended only from the Tyne to the Forth, and was known by the name of Bernicia. In 560 the Kingdom of Deira, the district between the Tees and the Humber, was added to Northumbria. During the eighth century it was the home of Cædmon, Bede, Alcuin, Egbert, and other great men of letters. In 792 it was ravaged by the Danes, and again in 844 and 867. It was the scene of important events in English history till the grant of the Lothians to the King of Scots, and the final conquest of Northumbria by William I.

North Walsham, a market town of Norfolk, England, on the Ant; served by the Midland and Great Northern Joint and the Great Eastern Railways. Lord Nelson was educated at the grammar school (founded 1606) at Paston, 8½ miles distant.

North-West Frontier of India. The North-West Frontier is roughly an area based on a chord 900 miles long from the Killick Pass to Karachi. Along this frontier of about 1000 miles in extent we have for neighbours Afghanistan and the various independent tribes, and behind these the vast territories of Russia—the highways leading towards India are not very numerous. The majority of the passes are of high altitude, very difficult, and snow-bound for the greater part of the year. Even when crossed they only admit to a region of few inhabitants, scanty supplies, and more mountain ranges. From the north the Khyber Pass is perhaps the best known and most used; then the Kurram, the scene of Lord Roberts's advance into Afghanistan in 1878; the Tochi and Gomal routes come next; and lastly the various routes from Kandahar towards Quetta. The Durand line fixes British responsibility with Afghanistan, and behind this there is the administrative frontier of India, which lies chiefly at the foot of the hills; between these two frontiers is a strip of tribal territory averaging perhaps about 60 miles in width, inhabited by independent tribes, an area where almost constant fighting is taking place, and where the lessons of mountain warfare are being repeatedly brought to notice.

This tract of country, which the Indian Government protects and occupies in certain areas, is a tangled mass of mountains, intersected with confusing defiles and ravines, the few roads there are being generally near British posts. Otherwise it is a mass of paths and tracks, all of which the inhabitants know intimately; the villages are generally tactically sited, and nearly all defended. Water is scarce, but where obtainable the soil is fertile. There are few large rivers. The smaller ones in winter are often dry, but in the summer after a thaw become raging torrents, which go down almost as rapidly as they rise, but are a serious obstacle to military operations. The climate varies according to the height. In winter it is very cold and bracing, but very hot and oppressive in summer, especially in the valleys. It is a bare, inhospitable region producing little food-stuff, and perhaps for this reason has few attractions for annexation.

The inhabitants of this area have from time immemorial raided all who have passed through their land, and have joined when they have felt so inclined the armies of the invaders of India. Almost every conqueror of India has hired their services; many of them have been enlisted in the Indian army, where they make excellent soldiers. They are known as Pathans, speak a language called Pashtu, are very democratic, ignorant, and fanatical, responding readily to the demand for a religious war. They are ideal skirmishers, and are hampered by no supply-columns, each man as a rule carrying ten days' rations on his person. As regards armament, they have no artillery, but are well supplied with rifles of recent pattern; and ammunition is far more plentiful than it was formerly; they have armourers of their own, who are clever, and make a number of quite good rifles, though gun-running furnishes the bulk of the supply, and the tribesmen invest their savings in the arms traffic. It is the ambition of every Pathan to be the possessor of a really good rifle. Their shock weapons are usually the knife and 'tulwar', a curved sword. They are quite good shots, thoroughly understand covering-fire, and as many of them have been trained by the British they are not an enemy to be despised.

The Pathan form of tribal government enables official relations of a sort to be maintained with British political officers; but the Councils of the Elders of the Tribe cannot always restrain the younger bloods, especially among the more democratic tribes.

North-West Frontier Province, a province of North-Western India formed in 1901, comprising the British districts of Dera Ismail Khan, Bannu, Peshawar, Hazara and Kobat, and the agencies of North Waziristan, South Waziristan, Chitral, Swat and Dir, the Khyber, and the Kurram. The prevailing religion is Mahommedanism, and the people are largely Pathans. Peshawar is the seat of administration. Only about one-third of the territory lying along the Punjab border is actually British territory. Between this and the Afghan frontier is the tribal area. The agencies and tribal lands have an area of about 25,472 sq. miles. The districts and administered territories have an area of 13,418 sq. miles, and a pop. (estimated) of 2,250,000.

North-West Passage, a passage for ships from the Atlantic Ocean into the Pacific by the northern coasts of the American continent, long sought for, and at last discovered in 1850–1 by Sir R. MacClure. It is of course valueless as a trade route. In 1903–5 Amundsen made the entire voyage in his vessel the *Gjoa*.

North-West Provinces. See *United Provinces of Agra and Oudh.*

North-West Territories, a northern region of the Dominion of Canada, subdivided (since 1st Jan., 1920) into the districts of Mackenzie, Keewatin, and Franklin. They include all Canada above the parallel of 60° N. lat., excepting Yukon, which was formerly known as Rupert's Land and the North-Western Territories. A Commissioner directs the government by a Council of four members. The Royal Canadian Mounted Police patrol the territories. Area, 1,242,224 sq. miles (34,298 sq. miles being water); pop. (estimated), 20,000. See *Canada*; *Mackenzie*; &c.

Northwich, a town of Cheshire, England, at the confluence of the Dane and Weaver; served by the London & North-Western Railway and the Cheshire lines. There are extensive mines of rock-salt, alkali-works, and breweries. Pop. (1921), 18,385.

Norton, Caroline, an English poet and novelist, grand-daughter of R. Brinsley Sheridan, born in 1808, died 1877. Her poems nearly all belong to the earlier part of her literary career. Her best novels are *Stuart of Dunleath* and *Old Sir Douglas.*

Norway (Norw. *Norge*), a maritime country on the western and northern sides of the Scandinavian Peninsula, bounded on the north-east by Russian Lapland, and east by Sweden, and washed on all other sides by the sea—by the Arctic Ocean on the north, the Atlantic and the North Sea on the north-west and west, and the Skagerrak on the south. It is about 1080 miles in length, and its greatest breadth is about 275 miles, but towards the north it narrows so much as to be in places not more than 10 miles wide; area, 125,000 sq. miles, or rather more than the British Isles. The total population on 1st Jan., 1920, was returned at 2,691,885. The country is divided into twenty prefectures, or *fylker*, of which the capital Christiania (pop. 1920, 263,713) forms one, and the city of Bergen (pop. 1920, 90,960) another. Other important towns and their populations are Trondhjem (pop. 55,032), Stavanger (44,620), and Drammen (26,000).

Physical Features.—Norway consists largely of a plateau of great geographical antiquity. Its rocks are chiefly composed of crystalline schists which had been worn down and the material redeposited as Sandstones, like those of the Scottish Highlands, at the earliest times known to geology. There is a steep slope to the Atlantic, and the highest mountains, many of which are snow-covered and support large glaciers, rise in the Norwegian side of Scandinavia, so that the rivers are generally short torrents rushing into the Atlantic, and are utilized for hydro-electric power-producing and for timber-floating.

The principal lake is the Miösen. An important feature in the 2110 miles length of coast-line is the occurrence of the deep fiords which attract so many tourists to Norway. They are deep rifts which run far back into the land. Their walls are steep; their course very angular; they frequently divide, reunite, and enclose mountain-blocks, which are cut off as islands when the valleys between are flooded by the sea.

Communications.—The country is so high that internal communications are difficult, and farming is only possible on the small flats deposited by rivers at the head of the fiords, or at the mouths of tributary streams that plunge over the edge of the plateau into the fiord. Hence the dwellers along the Norwegian fiords depend on boats for intercommunication. There were 1729 miles of State railways in 1919, and another 290 miles of line was under private control. The gauges are widely varied. All railways are to be electrified. There are eleven wireless stations throughout Norway, and one at Spitzbergen.

Production.—The chief mineral products are silver, copper ore, pyrites (the most important mineral for both its sulphur and copper content), felspar, iron ore, and nickel ore. The forests are estimated to cover an area of about 27,434 sq. miles, and form, with the fisheries, the most important source of national wealth. 75 per cent of the forests are under pine trees. Fishing employs upwards of 70,000 hands. In 1917 69,888 persons were engaged in the cod fisheries, 12,989 in summer herring fishery, and 5517 in mackerel fishery. Whale, walrus, and seal fisheries are also followed, 28,654 tons of whale-oil being produced in 1919. Agriculture is not a lucrative business, and large tracts fit for cultivation are non-existent. Some oats, barley, hay, wheat, and rye are produced (all in order of importance). Dairying, however, is more or less progressive.

Norway possesses much potential power in her innumerable torrents and waterfalls, and as she lacks coal this power is being developed to the utmost possible extent. This power is used chiefly in the production of electro-chemical products (ammonium nitrate, calcium nitrate, natrium nitrate, sodium nitrate, calcium carbide, and ferro-silicon), the most important manufacturing industry of Norway. Other manufactures include clothing, food-stuffs, leather and rubber, machinery, paper, tobacco, matches, wood pulp, condensed milk, and oil. Imports include food-stuffs, minerals (unwrought and manufactured), carriages, machinery, dye-stuffs, and vegetable produce.

Social Conditions.—The Norwegian fiord-dwellers are fishermen and farmers, and the Norwegians in general, in proportion to the size of their country, are one of the most nautical nations of Europe. The Evangelical Lutheran religion is endowed by the State and is the national Church, the king being supreme head and nominating the clergy. All other religions are tolerated (excepting Jesuits), but their number is very small, and includes only Roman Catholics (3000), Methodists (11,000), Baptists (8000), Mormons (700), and Quakers (150). Education is compulsory between the ages of six to seven and fourteen years. There is one university (founded 1211) at Christiania. It is State subsidized, as is also the Technical High School at Trondhjem.

Currency.—The Norwegian monetary unit is the gold *krone* of 100 *öre*; at par *kroner* 18·16 equals £1 sterling. Weights and measures conform to the metric system.

Government.—Norway is a limited hereditary monarchy, with a Constitution (*Grundlov*) dated 17th May, 1814. On a new succession the sovereign must be crowned at Trondhjem. The members of the Legislative Assembly or *Storting* are elected every three years by voters who have themselves been elected by the citizens possessing a certain qualification. It subdivides itself into two chambers—one, the *Lagting*, consisting of one-fourth of the members; the other, the *Odelsting*, has the remaining three-fourths. Every Bill must originate in the *Odelsting*. When carried in that body it is sent to the *Lagting*, and thence to the king, whose assent makes it a law. The king has a double veto, but should a Bill be passed by three successive *Stortings* formed by separate and subsequent elections, it becomes law automatically without reference to the king. Titles of nobility were abolished early in the nineteenth century. Government offices are open only to members of the Established Church.

Defence.—The army is a national militia, service being universal and compulsory between the ages of eighteen and fifty-five. Levies are called at the age of twenty-one years; they serve twelve years in the line, twelve years in the *landvärn* (national defence), and twelve years in the *landstorm* (local defence). There are 6 divisions of all arms, a flying-corps of 3 divisions, and the garrison artillery. Divisional strength is dependent upon the population of the recruiting area. Peace strength is about 118,500, with 228 field and 36 heavy guns and 71,836 rifles. 282,000 men are available for mobilization additionally. Armament comprises Krag-Jörgensen 6·5-mm. rifles and Erhardt quick-firing guns of 7·5 cm. The navy has 20 gunboats, 4 destroyers, 26 torpedo-boats, 4 submarines, and 10 mine-layers, but only 3 torpedo-boats and the mine-layers are modern. Personnel comprises 190 officers and about 1000 petty-officers and men. All seafaring Norwegians between the ages of twenty and forty-four years are liable to maritime conscription.

History.—In the earliest times Norway was divided among petty kings or chiefs (*jarls*), and its people were notorious for their piratical habits. Harald Haarfager (who ruled from A.D. 863 to 933) succeeded in bringing the whole country under his sway, and was succeeded by his son Erick. He was ultimately driven from the throne, which was seized in 938 by his brother, Hako I, who had embraced Christianity in England. Magnus the Good, the son of St. Olaf and Alfhild, an English lady of noble birth, was called to the throne in 1036; and having in 1042 succeeded also to the throne of Denmark, united both under one monarchy. (See *Denmark.*) After his death the crowns of Norway and Denmark again passed to different individuals. In 1319 the crowns of Norway and Sweden became for a short time united in the person of Magnus V. Erick of Pomerania succeeded, by separate titles, to Norway, Sweden, and Denmark; and in 1397 was crowned king of the three kingdoms. Sweden then for a time became a separate kingdom; but the union between Denmark and Norway was drawn closer and closer, and the latter ultimately became a mere dependency of the former. After the defeat of Napoleon by the Allies in 1813 it was arranged by the Treaty of Vienna in 1814 that Denmark must give up Norway, and the result was the union of the two countries under the Swedish crown, each remaining practically independent. The union was not unaccompanied by friction, partly owing to the democratic character of the Constitution of Norway. In 1905 Norway demanded a separate consular service, and, this being refused, the *Storting* declared the union with Sweden at an end. Sweden acquiesced on certain conditions, and Norway having (by plebiscite) decided to remain a monarchy, Prince Charles of Denmark, the husband of Princess Maud, daughter of King Edward VII, was invited to be king—now reigning as Haakon (or Hako) VII.—BIBLIOGRAPHY: C. L. Paus, C.B.E., *Industrial and Economic Conditions in Norway* (H.M. Stationery Office); T. B. Willson, *History of the Church and State in Norway*; A. R. Hope Moncrieff, *New World of To-day* (Gresham Publishing Company); R. N. Bain, *Scandinavia*; E. C. Otté, *Scandinavian History*.

Language.—Danish is employed by the higher classes and in the literature of Norway as a direct consequence of the former political union, but Norwegian exists side by side with Danish and Swedish as an independent language. In the written language two idioms exist, 'rigsmaal' and 'landsmaal', both being officially used. The Norwegian language is in most popular use in the country districts.

Literature.—The oldest Norwegian literary monuments are the runic inscriptions, dating

from the third century. In the ninth century Bragi composed poetry in the Old Norse language, and his poem *Ragnars Drapa* is incorporated in the *Snorra Edda* of Snorri Sturluson. In 1380 Norway was united to Denmark, and for over four centuries the country lost her national characteristics. Her literature, just as her history, is Danish. It is only since 1814, when by the Peace of Kiel Norway was ceded to Sweden, that a purely national Norwegian literature begins. The great poets of the early nineteenth century were H. A. Wergeland (1808–45) and J. Welhaven. The former first achieved success in 1829 with his lyrics, and one of his best poems is *Den Engelske Lods* (The English Pilot). A. Munch wrote *The Maid of Norway*, and Peter Christian Asbjörnsen (1812–85) utilized the folk-tales and popular poetry preserved among the Norwegian peasants, and in 1841 published, jointly with Jörgen Moe (1813–82), *Norske Folke Eventyr* (Norwegian Popular Tales). A new era of Norwegian literature was inaugurated by the works of Björnson and Henrik Ibsen (q.v.). No longer confined to Scandinavia, Norwegian literature has become known abroad and entered the arena of world literature. Among other modern Norwegian writers may be mentioned: the poet Herman Wildenvey (1885–); the dramatist G. Heiberg; and the novelists Jonas Lie, Alexander Kjelland (1849–06), and Knut Hamsun (1860–). Among Norwegian writers of accounts of polar explorations are Roald Amundsen (q.v.) and Fridtjof Nansen (q.v.).—BIBLIOGRAPHY: E. W. Gosse, *Dano-Norwegian Literature*, 1815–65; P. Botten-Hansen, *La Norvège littéraire*.

Music.—The outstanding and characteristic figure in the history of Norwegian music is, of course, that of Eduard Grieg (1843–1907), and a sketch of Norwegian music must centre on him. Born at Bergen in 1843, he received his first music lessons from his mother, who was an excellent pianist. It is interesting to note that his great-grandfather, Alexander Greig, was an Aberdeen merchant, who fled to Bergen in 1745, having taken a part in the Jacobite rising of that year. Grieg's school days over, he proceeded to the Leipzig Conservatoire, where, among others, he had as fellow-students Arthur Sullivan, Edward Dannreuther, Franklin Taylor, and Carl Rosa. Having completed his student period at Leipzig, he selected Copenhagen as a centre to work in, and here he came under the influence of Gade and Nordraak. Soon after, he transferred his energies to Christiania, where he married his cousin, Nina Hagerup, in 1867. At this time he was greatly encouraged and helped by Liszt, and as a result of his interest and commendation, the Norwegian Government granted the composer a pension. He was now able to give up teaching, and to devote all his time to composition, and from this period onward we have some of the most original and personal work of the composer. Leaving Christiania, he settled at Bergen, where he at once set to work on the composition of music to Ibsen's play *Peer Gynt*, which brought him a world-wide reputation. His position as a composer was now assured and established, and dating from the production of his *Peer Gynt* music to his death at Bergen in 1907, his career was a steady record of success. The outstanding qualities of Grieg's music are its poetry, refinement, originality, and harmonic freshness. His most notable works are the music to *Peer Gynt*, the Piano Concerto, the three Sonatas for Violin and Piano, and many beautiful songs and piano pieces.

Apart from Grieg, the most distinguished names in the history of Norwegian music are Ole Bull (1810–80), a romantic figure, who, though remembered chiefly as a violinist, did much to establish a Norwegian school of music, and was one of the first to encourage the young Grieg; Kjerulf (1815–68) is best known by some charming songs and short piano pieces; Svendsen (born 1840), whose well-known *Romance* for violin, and brilliant and effective orchestral pieces, particularly the four Norwegian Rhapsodies, and *Carnival at Paris*, have made his name familiar in all the concert-rooms of Europe; Richard Nordraak (1842–66), whose untimely death at the early age of twenty-four cut short a life of great promise; Christian Sinding (born 1856), who, with Grieg, is generally regarded as the most original and characteristic composer of the Norwegian school; his best works are a fine Symphony in D minor, some excellent chamber music, and many attractive piano pieces which have become very popular.

Norway-maple, a tree of the genus Acer, the *A. platanoides*, which grows to a great size and has large handsome leaves resembling in shape those of the vine. It grows in Norway, Germany, Switzerland, &c. Its wood is held in great estimation, and its juice yields sugar.

Norway-spruce, a valuable tree of Norway and Northern Europe, the common spruce of Britain—*Picea* (less correctly *Abies*) *excelsa*. See *Spruce*.

Norwich (nor′ich), a city and county borough of England, the county town of Norfolk, on the Wensum near its confluence with the Yare, and served by the Great Eastern Railway and a Midland Railway and Great Northern Railway joint-line. It is a picturesque old town, and with its gardens and orchards covers a large area. The Cathedral of Holy Trinity, founded in 1096 and completed about 1500, exhibits varying styles of architecture. It has extensive cloisters, and a lofty tower and spire 315 feet high. There is also a modern Roman Catholic cathedral. The castle, a noble feudal relic, reputed to have been built by Uffa about 1066, is practically a ruin; part is used as a museum and art gallery. St. Andrew's Hall, originally the nave of the Blackfriars' Church, the Guildhall, and the bishop's palace, also deserve mention. The industries comprise boot- and shoe-making; the spinning of woollen, worsted, and mohair yarns; the making of mustard, starch, and blue; iron-working, brewing, &c.

The town was founded in the fifth century, rose to be capital of the Kingdom of East Anglia, and, by the middle of the tenth century, was a large and wealthy town; but in 1002 it was laid in ashes by the Danes. Shortly after rebuilding by the Danes, it had become (eleventh century) a large and populous place, and its prosperity kept steadily increasing till in 1328 Edward III made it a staple town for Norfolk and Suffolk. He induced Flemish weavers to settle in it, and others arrived during the reign of Elizabeth. Its worsted goods were long famous. Since 1298 it has had separate representation in Parliament. Pop. (1921), 181,863.

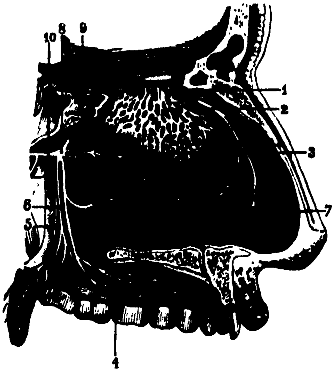
Norwich, a city of Connecticut, United States, the county seat of New London county, on the Thames; served by the New York, New Haven, & Hartford, and the Central Vermont Railways, and by steamers. Hydro-electric power is derived from the local falls of the Thames. Norwich was settled in 1659, and became a city in 1784. Pop. 29,685.

Norwich Crag, in geology, an English formation belonging to the later Pliocene, resting on the Chalk and London Clay. It consists of irregular beds of ferruginous sand and clay, and at the base a bed with remains of Mastodon, Elephas, Hippopotamus, Equus, and other mammals, associated with marine shells.

Norwood, a residential district of South-East London, in the south of the borough of Lambeth. It represents the site of a seventeenth-century oak forest.

Norwood, a city of Ohio, United States, in Hamilton county; served by the Cincinnati, Lebanon & Northern, and the Baltimore & Ohio S. W. Railways. It is a north-eastern suburb of Cincinatti, was settled in 1789, incorporated in 1888, and became a city in 1902. Pop. (1920), 24,966.

Nose, the organ in man and the higher animals exercising the sense of smell, and concerned through its apertures or passages in the function of respiration and in the production of voice. The bones of the nose comprise the boundaries of the nasal *fossæ* or cavities, which open in front in the nasal apertures, and behind into the pharynx or back part of the mouth. The front nostrils, or openings of the nose, are in the skeleton of an oval or heart shape, while the openings of the posterior nostrils are of a quadrilateral form. The bones which enter into the entire structure of the nose number fourteen. In addition there are certain cartilaginous pieces which assist in forming the structure of the nose, lateral cartilages on either side, and a cartilaginous septum in the middle between the two nostrils. There is also a bony septum which unites with the cartilaginous septum to form the complete partition of the nose. Several special muscles give a certain mobility to the softer parts of the organ. The nostrils and nasal cavities are lined by the mucous membrane, richly furnished with arteries and veins and covered with a copious mucous secretion which keeps it in the moistened state favourable to the due exercise of the function of smell. The proper nerves of smell, the *olfactory* nerves, form the first pair of cranial nerves or those which are connected with the brain; while the nerves of common sensibility of the nose belong to the fifth pair of cranial nerves. The olfactory nerves are distributed in the mucous membrane of either side in the form of a sort of thick brush of small nerve-fibres. The study of the comparative anatomy of the nasal organs shows us that man possesses a sense of smell greatly inferior in many instances to that of the lower animals. The distribution of the olfactory nerves in man is of a very limited nature when compared with what obtains in such animals as the dog, sheep, &c. All Vertebrates above fishes generally resemble man in the essential type of their olfactory apparatus. In most fishes the nostrils are simply shut or closed sacs, and do not communicate posteriorly with the mouth. The



Distribution of Nerves over Interior of Nostril
(outer wall)

1, Branch of nerves of small olfactory nerve. 2, Nerves of common sensation to the nostril. 4, 5, 6, Nerves of the palate springing from a ganglion at 8. 3, 7, 9, Branches to nasal cavities. 10, Communication with facial nerve.

proboscis of the elephant exemplifies a singular elongation of the nose, in which the organ becomes modified for tactile purposes. In the seals and other diving animals the nostrils can be closed at will by sphincter muscles or valves. The most frequent diseases or abnormal conditions which affect the nose comprise congenital defects, and tumours or polypi.

Nossi-bé, a French island off the north-west coast of Madagascar, of which it is a dependency. It is about 14 miles long by 8 miles broad, has a mountainous surface, and appears to be of volcanic origin. Rice, maize, tapioca, and bananas are the principal products. The chief town is Hellville (named after Governor de Hell, who occupied the island in 1841). The harbour is good. Area, 130 sq. miles (including adjacent islands); pop. about 15,000 to 20,000.

Nostoc, a genus of Blue-Green Algæ. The plants consist of rounded or lobed masses of jelly, in which is embedded a tangle of necklace-like filaments composed of minute spherical cells. Some species are edible, and others are constituents of various lichens (e.g. Collema).

Nostrada'mus, true name *Michel de Nostredame*, a French physician and astrologer of Jewish extraction, born 1503, died 1566. He studied first at Avignon, and afterwards at the medical school of Montpellier. After taking his degree he acted for some time as a professor, but eventually settled as a medical practitioner at Agen, and finally, after travelling in Italy, at Salon, near Aix, about 1544, where he wrote his famous *Prophéties* or astrological predictions written in rhymed quatrains. They obtained great success, although many condemned their author as a quack. Catherine de' Medici invited him to court to cast the horoscope of her sons; the Duke of Savoy travelled to Salon for the express purpose of visiting him, and on the accession of Charles IX he was appointed royal physician. In 1550 he published an *Almanac* containing predictions about the weather, the first of a numerous family of such productions.

Notables, in French history, a body consisting of noblemen, archbishops, high legal functionaries, and magistrates of cities, appointed and convoked from time to time by the king, as being a more pliant instrument than the States-General. The first assembly of notables of any importance was in 1558. From 1626 there had been no meeting, but the troubles preceding the Revolution led to the notables being assembled in 1787. A second meeting was held in Nov., 1788, to consult on the manner of assembling the States-General; but soon after everything was overturned by the Revolution.

Noto, a town of Sicily, in the province of Syracuse. *Old Noto* (ancient *Netum*) was destroyed by earthquake in 1693, and the present city was built ten years later. Pop. 31,600.

Notor'nis, a genus of the rail family, which inhabited the South Island of New Zealand until recently, but is now apparently extinct. The Notornis is most nearly allied to the Coots. It is, however, of larger size than these birds, and differs from them in the vestigial nature of the wings.

Notothe'rium, an extinct genus of marsupial or kangaroo-like animals, the fossil remains of which are found in deposits of Upper Pliocene age in Australia. It is somewhat smaller than its gigantic ally Diprotodon (q.v.).

Nottingham, a city of England, the county town of Nottinghamshire, near the Trent; served by the Great Northern, the Great Central, and the Midland Railways, and by canals. It occupies a site overlooking the Vale of Trent, and has one of the finest and largest market-places in the kingdom. The castle, which crowns the summit of a rock, was originally built by William the Conqueror as a means of overawing the outlaws frequenting the recesses of Sherwood Forest. Dismantled by Cromwell, it subsequently became the property of the Duke of Newcastle, who in 1674 erected a large mansion on part of the site. This, after being partly burned in riots connected with the reform movement in 1831, now contains the Midland Counties Art Museum, free library, &c. The principal educational and literary institutions are the University College and Technical School, High School for boys, the Blue-coat School, the School of Art, the People's Hall, and the Mechanics' Institute. An arboretum covering 18 acres is a feature of the town. The staple manufactures are hosiery and lace, the latter being a sort of speciality. There are also manufactures of cotton, woollen, and silk goods, and of articles in malleable and cast iron. The borough sends four members to Parliament.

Nottingham was a place of importance in Anglo-Saxon times, and was twice or thrice taken by the Danes. Charles I raised his standard here in 1642, and next year the town and castle were taken by the Parliamentarians. Serious riots, occasioned by the introduction of machinery, took place in 1811–2 and 1816–7. On the rejection of the reform bill by the House of Lords in 1831 there was again repeated rioting. It became a city in 1897. Pop. (1921), 262,658.

Nottingham, or **Notts**, an inland county of England. Area, 540,123 acres, of which about 454,000 are arable, meadow, and pasture. The general surface, with exception of the Vale of Trent, is undulating. The principal river is the Trent, with its affluents the Soar and Idle. The greater portion of its area is composed of rocks of the Permian and New Red Sandstone systems. The chief mineral is coal. The soil is generally extremely fertile. The crops usually cultivated are wheat, rye, barley, oats, beans, and pease. The manufactures include lace, hosiery, machinery, silk- and cotton-spinning, bleaching, coal-mining, iron- and brass-founding, glove-making, &c. The county returns five members to Parliament. Pop. (1921), 641,184.

Under the Saxons Nottinghamshire was a part of Mercia, and eventually passed to the Danes. There are scattered remains of antiquarian interest.

Nou'menon (plural, *Noumena*), in Kant's philosophy, an object conceived by the understanding or thought of by the reason, as opposed to a *phenomenon*, or an object such as we represent it to ourselves by the impression which it makes on our senses. The *noumenon* is an object in itself, not relatively to us.

Novara, a province of Piedmont, Italy, on the Swiss frontier. Area, 2548 sq. miles; pop. about 770,000.

Novara, a city of Italy in and capital of the province of Novara, situated between the Agogna and Terdoppia Rivers, and a railway junction for Milan (81 miles) and Turin.

Nova Scotia, a maritime province of Canada. It is divided into two parts, a southern or mainland division forming a peninsula connected with New Brunswick by the narrow Isthmus of Chignecto, and a northern or island division (Cape Breton Island) separated from the peninsula by the Strait of Canso. Halifax is the capital, principal seaport, and largest city; other towns are Sydney (pop. 18,000), Glace Bay (17,000), Amherst (9000), Yarmouth (6700), and New Glasgow (6500).

Communications.—Nova Scotia is covered by an intricate railway system, and transportation facilities are highly developed. There are (1918) 1480 miles of steam railway track, including the systems of the Canadian Government, Halifax & South-Western & Inverness (Canadian Northern ownership), and the Dominion Atlantic (owned by Canadian Pacific). A regular subsidized coasting service is maintained by steamboats plying between all ports.

Social Conditions.—As a single body Roman Catholicism is the predominant religious belief, Protestants—Baptists, Anglicans, Methodists, and Congregationalists—following in order of importance. Other faiths are practically non-existent. Education is free and compulsory, and is undenominational. The Provincial Agricultural College and a Teachers' Training College are located at Truro, and there is a Provincial Technical College granting degrees in mining, chemical, electrical, and civil engineering. There is no direct Government taxation, and revenue accrues chiefly from the Dominion subsidy, royalties on coal and minerals, and from special taxes on motor-cars, theatres, marriage licences, banks, and incorporated companies.

Production: Agriculture.—Fruit is cultivated, apples being the principal crop. The province is suitable for and is largely devoted to dairy-farming. The wool-clip yields over 1,000,000 lb. annually, and there are pigs innumerable. Wheat, oats, roots, hay and clover, and potatoes are raised. *Forests.*—12,000 sq. miles of Nova Scotia are afforested, and include spruce, fir, hemlock, oak, maple, and birch trees. *Fisheries.*—Cod, lobster, herring, mackerel, and haddock are caught in the Nova Scotia fisheries—the most extensive in Canada. *Minerals.*—Coal, iron, gold, copper, silica, gypsum, antimony, lead, silver, limestone, manganese, tungsten, and diatomaceous earths are found. The present coal-field covers an area of 725 sq. miles, and the gold-field about 3000 sq. miles. Steel and iron are also produced.

Area, &c.—The area of Nova Scotia is 24,488 sq. miles (860 sq. miles being water surface). Pop. (estimated), 500,000; in 1911 it was 492,338.

History, &c.—Nova Scotia was settled by the French as Acadia (q.v.). It was one of the original provinces of the Dominion, and under the British North America Act of 1867 it is empowered to make laws and to exercise control generally over purely local affairs. The Legislature comprises a Lieutenant-Governor appointed and paid by the Federal Government, a Legislative Council (21 members, nominated for life by the Crown), and a House of Assembly (43 members, chosen by popular vote and sitting for five years). Ten Senators and 16 members of Parliament are sent to Ottawa. See *Cape Breton.*—Cf. P. H. Smith, *Acadia.*

Novaya Zemlia, a Russian archipelago in the northern littoral of European Russia. It represents, physically, the continuation of the Ural Mountains into the Arctic Ocean. There are two main islands, which have a combined length of about 600 miles, and separate the Kara sea on the east from Bahrent's Sea on the west. It is very mountainous. Novaya Zemlia was discovered by Richard Chancellor in 1553, and Stephen Borough landed on the southern island in 1556. Many expeditions have included the group in the itinerary of their polar voyages.—Cf. A. P. Engelhardt, *A Russian Province of the North* (translated by H. Cooke).

Novel. The modern novel and the mediæval romance of love and prowess have, each taken at its best, much in common, and that in things essential, character and character-revealing incident, yet, both for practical purposes and in reality, they are distinguishable by the difference of setting, the fact that while the world of romantic happenings lies east of the sun and west of the moon, in the days of brave King

Arthur or good Haroun Al-Raschid, the world of the novel is that of real life, primarily and preferably 'actual, ordinary' contemporary life, in the historical novel the life of the past reproduced so as to give the illusion of this vivid contemporaneity. The novel adds to the interest of incident, character, and sentiment that of vividly portrayed manners and environment. It is thus naturally a product of the time in which, after the revival of learning, men's minds were turning away more and more from romance to the ever closer study of the realities of life and character. The way was prepared by such reactions against romance as the picaresque story and the parody of romance, both the product of Spain, the last home of chivalrous romance; and the greatest of these, *Don Quixote*, caught at once and to perfection the atmosphere of everyday, open-air, genial life and humanity. In England the picaresque story received masterly handling from Defoe in *Robinson Crusoe* (1719–20), *Moll Flanders* (1722). Bunyan's allegory clothed itself in the garb of everyday life as naturally as Spenser's in the splendours of romance and poetry. Swift related impossible and grotesque adventures with an air of sober reality. Comedy and satire all tended in the same direction, but the immediate precursor of the novel was the periodical essay, *The Tatler* and *The Spectator*, the delighted interest they aroused in the little details of life and manners, and their didactic but fresh handling of problems of conduct and sentiment. Samuel Richardson (1689–1761) completed the work in his *Pamela* (1740), *Clarissa* (1748), and *Sir Charles Grandison* (1753). *Clarissa*, the greatest of these, with a picture of certain aspects of English life presents in letter-form the dramatic and tragic history of a fatal conflict of wills, in the heroine the revealing conflict of inclination and principle in a high and heroic but intensely human soul. Beginning with a parody of *Pamela* and its too prudential ethics, but taking the line of construction indicated by the picaresque story and *Don Quixote*, Henry Fielding (1707–54) in *Joseph Andrews* (1742), *Tom Jones* (1749), and *Amelia* (1751) gave in flowing and buoyant prose a genial yet ironical and penetrating picture of English life, higher and lower, in country and city. The irritable Scotsman Tobias Smollett (1720–71), following the picaresque line of violent and sordid incident more closely, and drawing considerably on his personal experience in *Roderick Random* (1748) and *Peregrine Pickle* (1751), presented in angry and lurid colours a picture of lower London life and drew some notable professional types. In *Humphry Clinker* (1771), in the letter fashion of Richardson, he gave a delightful picture of Bath and Clifton, London and Scotland, and of the adventures of an admirable group of realistic characters touched with the exaggeration of the humourist. The Irishman Laurence Sterne (1713–68), a virtuoso of the first water, the Harry Lauder of the English novel, able to delight and hold us by gesture and grimace, showed in *Tristram Shandy* (1759–67) and *A Sentimental Journey* (1768) that the novel could dispense with plot, almost with incident, so long as it preserved the realistic setting, character, humour, and sentiment. Oliver Goldsmith's *The Vicar of Wakefield* (1766) adds no new feature, but bears the impress of a charming fancy, sentiment, and humour

These great creators of the modern novel of contemporary life and manners, humorous, sentimental, realistic, had many contemporaries and successors, of whom, passing over eccentric divagations, as Thomas Amory's *John Buncle* (1756), Robert Paltock's *Life and Adventures of Peter Wilkins* (1751), and Eric Raspe's *Baron Munchausen's Narrative* (1785), the legitimate continuers are Frances Burney, whose *Evelina* (1778) delighted readers by its picture of London society, its impression of life studied freshly and directly "*from* the life, disguised and adulterated as little as possible by *exceptional* interests and incidents", which is the soul of the novel; and, at the beginning of the next century, Maria Edgeworth, whose vivid pictures of Irish manners in *Castle Rackrent* (1800), *Ormond* (1817), *The Absentee* (1809) helped to direct Scott to similar work, and Jane Austen, whose earliest works, *Northanger Abbey*, *Pride and Prejudice*, *Sense and Sensibility*, were written long before publication. In these and the later *Mansfield Park* (1814), *Emma* (1815), and *Persuasion* (1818), Miss Austen, working within the narrow limits of her experience and in a spirit of gentle and amused but penetrating satire, drew life with entire veracity and impeccable art if limited sympathy. Meantime the sphere of the novel had been invaded by the spirit of romance, inaugurated by Horace Walpole's *Castle of Otranto* (1764), and revolution, which produced a flood of pseudo-romantic, pseudo-historical, and Rousseau-ish didactic novels, which include Beckford's brilliant extravaganza *Vathek* (1786), Mat Lewis's *The Monk*, Mrs. Radcliffe's *The Mysteries of Udolpho* (1794–5) and *The Italian* (1797), William Godwin's *Caleb Williams* (1794), Thomas Day's *Sandford and Merton* (1783–9). Most of them are but names now, but the effort to combine with the actuality of the novel the romantic effects of mystery, the charm of scenery, and the 'sense of the past' enlarged the scope of fiction. To it we owe not alone the historic novel of Scott and his followers, but such occasional real achievements in the element of spiritual and psychological mystery as Lytton's *Haunted and the Haunters* (1859), Dickens' *Edwin*

Drood (had that been completed), Stevenson's *Doctor Jekyll and Mr. Hyde* (1886), and Oscar Wilde's *Dorian Gray*.

What was legitimate in the craving for a more imaginative picture of life in the Romantic Movement was satisfied in the main by Sir Walter Scott (1771–1832), who combined the solid and satisfying portrayal of character and manners of his great eighteenth-century predecessors with a vivid rendering of past ages, romantic scenery, and heroic figures. What has proved most enduring in the *Waverley Novels* (1814–32) of which the greatest are the distinctively Scottish novels, is the truthful and humorous portrayal of bourgeois and peasant character presented as in essentials the same in all ages. Scott's successors in the Victorian Age swung back from romance to realism, but the social interest, which the novel had manifested from its outset and which the reforming spirit of the Revolution had made more impatient for practical remedies, gave an obvious purpose to the satire of Thackeray, the satire and sentiment of Dickens, the high seriousness of George Eliot, the impulsive sympathy of Kingsley. The range of life too which the novel reflected was enlarged: politics in Disraeli and others, the life and mind of children, provincial life and slum life, asylums, prisons, convict-establishments (as in Charles Reade's *It is Never too Late to Mend*)—nothing is outside the compass of the modern novel. Of the Victorians the supreme creator is Charles Dickens. From *Sketches by Boz* (1833) to *Edwin Drood* (1870) he painted the life and character he knew, that of the lower middle and upper lower classes of London and English towns, with representative types from other spheres, with vividness and with a touch of the fanciful and the grotesque which it is difficult to assign aright to his imagination or his penetrating vision. He combines some of Shakespeare's creativeness with Ben Jonson's close observation of manners and oddities. William Makepeace Thackeray (1811–63) excelled in the portrayal of just those classes which Dickens drew with least understanding. In *Vanity Fair* (1847–8), *Pendennis* (1849), *The Newcomes* (1854–5) he showed himself the brilliant satirical painter of English upper-class snobbery in a period of its most devastating ravages. Both Dickens in *Barnaby Rudge* and *A Tale of Two Cities*, and Thackeray in *Henry Esmond* and *The Virginians*, diverged from their main trail into the historical novel, but with little shifting of the centre of interest in the work of each—vivid if grotesque portrayal of character in the one, a flowing comment full of irony and sensibility on life, its beauties and its follies, in the other. Charles Kingsley's *Alton Locke* (1850) and *Yeast* (1851) are studies with a purpose of modern society, as are most of Charles Reade's novels, but Kingsley's *Hypatia* (1853) and *Westward Ho!* (1855) and Reade's *The Cloister and the Hearth* (1861) are brilliant essays in the historical romance coloured by a modern didactic reference. George Eliot's serious and heavily charged novels are at their best in their pictures of provincial manners, *Scenes from Clerical Life*, *Adam Bede*. In *Romola*, an historical novel, she failed. Disraeli's novels combine a strain of commonplace sentimental fiction with a brilliant portrayal of the political and social setting in which the events are presented. A less brilliant and thoughtful writer than Thackeray, nearer to Jane Austen but with a stronger vein of sentiment, Anthony Trollope (1815–82) proved himself, especially in the Barsetshire novels, *The Warden* (1855) and others, an even finer, more good-humoured portrayer of the amenities and snobbery of English life in clerical and county circles. The Brontës, Charlotte and Emily, in *Jane Eyre* (1847), *Villette* (1853), *Wuthering Heights* (1847), brought into the novel a new strain of passion with its power to transfigure ordinary persons, happenings, and surroundings. Of Mrs. Gaskell, a real artist, Lytton, Wilkie Collins, Blackmore, William Black, and others—all popular Victorian novelists—no more than mention is possible.

The dominating figures in English fiction as the reign of Queen Victoria drew to a close were George Meredith and Thomas Hardy, and of younger men Rudyard Kipling and Robert Louis Stevenson, and the influence of the older men is stronger to-day than that of the younger. The younger men rather extended the sphere of the novel or played new varieties on older themes than essentially modified its tone. Kipling is the novelist of Anglo-Indian and soldier life, with a rare command of colloquial and poetic idiom. *Kim* (1901) is his greatest single achievement. Stevenson went back to the theme of the romantic novel of Scott in *Kidnapped*, *Catriona*, and *The Master of Ballantrae*, and explored fresh romantic fields in the South Sea Isles, all in a style of elaborate beauty of melody and rhythm, which raised the level of literary technique in the novel. Meredith and Hardy are the realists of a new age which had parted with the Christian tradition which from Richardson to Dickens had provided a spiritual relief from the tension of tragic or sordid story. They contemplate life in the disillusioning light of Darwinian science, blending comedy and tragedy, Meredith in a style of over-strained subtlety and brilliance, Hardy in language of simple and beautiful clarity. Meredith's favourite *milieu* is aristocratic and wealthy society, *Richard Feverel*, *Evan Harrington*, *The Egoist*, &c.; Hardy's greatest achievements, *Far from the Madding*

Crowd (1873), *The Mayor of Casterbridge* (1886), *The Woodlanders* (1887), *Tess of the d'Urbervilles* (1891), delineate middle-class and peasant types from the south-west of England. Their influence has been felt in a more sombre, unrelieved realism in the work of George Gissing, *Demos* (1886), *New Grub Street* (1891), *The Odd Women* (1893); of Hale White, *Mark Rutherford*, *Catherine Furze*, and others; in Arnold Bennett's *The Old Wives' Tale*; and John Galsworthy's studies of the injustice of social conditions and moral conventions, *The Forsyte Saga*. But romance has never lost its charm for English readers, and Stevenson has been followed in the romance of character and incident as in beauty of style by Joseph Conrad, *Youth*, *Lord Jim*, *Chance*, *The Typhoon*, and others. Nor has pure comedy been banished, witness the lighter work of Bennett and the riverside yarns of W. W. Jacobs, *Many Cargoes*, *At Sunwich Port*. The provincial and regional novel of John Galt, Sir Walter Scott, Maria Edgeworth, has been carried on by J. M. Barrie, *Auld Licht Idylls*, James Stephens, *A Crock of Gold*, and many others; while the pure fairy tale has taken from the novel the vivid realistic setting: Lewis Carroll's *Alice in Wonderland*, Stevenson's *New Arabian Nights*, and G. K. Chesterton's extravaganzas *The Napoleon of Notting Hill*, *The Man who was Thursday*, *The Ball and the Cross*. The interest of H. G. Wells's scientific romances, *The War of the Worlds*, *The Invisible Man*, &c., is the exhibition of human nature, English suburban humanity as the same in all circumstances. His latest stories enrol him with the social reformers. Of all sciences psychology has most allured the novelist, and the greatest of recent novelists, the American - Englishman Henry James, enriched the craft of the novelist by the subtlety with which he portrayed the inner conflict of mind and heart so much richer than the external drama: *The American*, *What Maisie Knew*, *The Awkward Age*, *The Golden Bowl*, *On the Wings of a Dove*. Recent theories of pyschology are reflected vividly in the works of D. H. Lawrence, *The Lost Girl*, May Sinclair, James Joyce, and others, and in *The Midget* Walter de La Mare has suggested with delicacy of feeling and imagination the mind and heart of a dwarf.

Nov′gorod, or **Veliki - Novgorod** ('Great Novgorod'), a town of Russia, capital of the government of the same name, on the Volkhov, near the point where it issues from Lake Ilmen, 103 miles S.S.E. of Petrograd. It was during the Middle Ages the largest and most important town of Northern Europe. It is divided into two parts by the river, the Kreml or citadel and the trading town. The former contains the cathedral of St. Sophia, built after the model of St. Sophia at Constantinople; besides which there are numerous churches and several monasteries. Novgorod was the cradle of the Russian monarchy, and a monument was erected in 1864 to commemorate the thousandth anniversary of the foundation of the Russian state by Rurik. Pop. 27,100.

Novgorod, a government of Russia; area, 47,236 sq. miles. It is generally flat, a considerable portion of it being covered with lakes and marshes. The low range of the Valdai Hills enters it in the south-west and forms the principal water-shed separating the basin of the Baltic from that of the Volga. The lakes are numerous, and three of them of great extent—Vosje, Bielo-Osero, and Ilmen. A great part of the surface is covered by forests. The principal crops are rye, barley, oats, flax, and hemp. Pop. 1,658,000.

Novi, or **Novi Ligure**, a town of Piedmont, Italy, in the province of Alessandria. At Novi on 15th Aug., 1799, the French under Joubert (who was killed) were defeated by the Russians and Austrians. Pop. 18,000.

Novi-Bazar′, **Novi-Pasar′**, or **Yenipasar**, a town of Yugo-Slavia, formerly in Turkey, and assigned to Serbia in 1913. It is situated on the Rashka, 130 miles south-east of Bosna-Serai. From 1878 to 1908 it was held by Austria. Taken by the Austrians in 1915, it was recaptured by the Serbians in Oct., 1918. Pop. 13,000.

Novorossisk, a seaport of Caucasia, on the Black Sea, near the western extremity of the Caucasus, with large petroleum-shipping trade and exports of cereals. Pop. 60,000.

Novo-Tcherkask′ ('New Tcherkask'), the capital of the Don Cossack Territory, in South Russia, on a tributary of the Don, 40 miles from the Sea of Azov, founded in 1805 by the inhabitants of Old Tcherkask. It has a considerable trade, but the manufactures are unimportant. Pop. 65,000.

Noyades (nwá-yăd; Fr., from *noyer*, to drown), the name given to the execution of political prisoners by drowning them, practised during the French Revolution, especially by Carrier at Nantes. One method adopted was crowding the victims into a boat, withdrawing a plug in the bottom, and casting them adrift.

Nubia, a name popularly given, in a more or less restricted sense, to the region of North-East Africa lying south of Egypt and forming the northern portion of the Anglo-Egyptian Sudan (q.v.). Remains of ancient edifices are numerous, chiefly below Dongola. The Nubians belong to the Arabian and Ethiopian races, who converge in the Nile basin; they are a handsome race, of dark-brown complexion, bold, frank, cheerful, and more simple and incorrupt in manners than their neighbours either up or down the river.

Their language is a variety of the negro speech of Kordofan. Pop. estimated at 1,000,000 or 1,500,000.

Nuble, an inland province of Chile, watered by the Nuble and other streams, and sloping from the Andes to Concepción. Wheat and stock are raised in the west; vine-growing is progressive. Chillán is the capital. Area, 3498 sq. miles; pop. (1919), 202,594.

Nucellus, the central solid portion of the ovule, internal to the integuments, constituting, in flowering plants, the megasporangium in the strict sense. See *Ovule*.

Nudibranchiata, the sea-slugs, a group of marine gastropod molluscs. They have no shells in their adult state, and there are no true gills. Breathing is effected by the skin, or by variously shaped projections from the body. The sea-lemons (Doris) are a common example.

Nueva Esparta, an insular state of Northern Venezuela, on the Caribbean Sea. Margarita (q.v.) is the main island. La Asunción is the capital. It lies on the east shore of Margarita, but the harbour and many of the buildings are tumble-down and generally dilapidated. Panamá hats, linen, hammocks, and bricks are made. State pop. (1921), 56,035. Capital (estimated), 3000. See *Venezuela*.

Nuisance, a legal term used to denote whatever is a serious annoyance to one's neighbours or to the public at large, in the exercise of their rights. In England nuisances are of two kinds—*public* or *common* and *private*. Public nuisances include: obstruction of highways, bridges, and public rivers; dangerous and offensive trades and manufactures; polluting water so as to affect the public health; exposure in public of persons suffering from contagious disease; disorderly houses; &c. A private nuisance may be defined as an injury or annoyance to the person or property of an individual. A public nuisance may be also a private nuisance if one particular individual thereby suffers greater injury than the public generally. In the law of Scotland there is no recognized distinction between public and private nuisances. Whatever obstructs passage along the public ways, or whatever is intolerably offensive to individuals in their homes, constitutes a nuisance. Causing inconvenience to one's neighbours may not in itself be a nuisance at law; there must be positive discomfort or danger. A prescriptive right to commit a nuisance may be acquired. One of the chief Acts dealing with the removal of nuisances was the Public Health Act of 1875; and there are also local Acts dealing with specific nuisances within certain districts, laws giving special powers to municipal corporations, &c. By these Acts power is given to some local authority to carry out the provisions of the Acts. The local authority is to appoint a sanitary inspector, who is empowered to remove or remedy nuisances, such as the carrying on of noisome trades or manufactures; he may be empowered, on reasonable complaint, to demand an entrance into private premises so as to inspect their condition; and may order the removal of the nuisance. If the offender refuse compliance, the local authority may remove the nuisance at his expense, and sue him for such expenses. Besides the local authority, any resident or owner of property in the district may institute proceedings on behalf of the public for the abatement of a public nuisance and the punishment of the offender. The remedy is by way of indictment or information. Any individual who has suffered particular damage or injury beyond the general injury to the public may, if the injury is substantial, proceed against the offender by way of an action of damages or an injunction, or both, as in the case of a private nuisance. See *Public Health Acts*.

Nul'lipore, a name given to certain Red Algæ (species of Lithothamnion, &c.) common on coral islands. From secreting lime on their surface, and forming reefs like coral, they were formerly supposed to be a kind of zoophytes.

Numantia, an ancient town of the Arevaci in Spain, on the Douro, and near the town of Soria in Old Castile. It had great natural strength, and is celebrated for its desperate resistance to the Roman power, especially in the siege by Scipio Africanus in 134–133 B.C., when it had to surrender, though most of its defenders then surviving put themselves to a voluntary death. The town was destroyed by the conqueror.

Numa Pompilius, the second king of Rome, who is said to have reigned from 714 to 672 B.C. He was of Sabine origin, and was distinguished as a philosopher and legislator, though, like the other early kings, he has more a legendary than a historical existence. He was regarded as the founder of the most important religious institutions of the Romans, and left writings explanatory of his system, which were burnt by order of the Senate when accidentally discovered 400 years after his time.

Number, in the simplest sense of the word, is synonymous with *positive integer*; in this sense a number is one of the series 1, 2, 3, 4, &c. With these numbers addition and multiplication are possible always, subtraction and division in certain cases only; we cannot take 5 from 3, nor divide 12 by 7. All restrictions on the generality of the operations of subtraction and division are removed when we introduce negative and fractional numbers. The numbers thus placed at our disposal have the form $\pm p/q$, where p and q are positive integers. Such numbers constitute the field of *real and rational* number. If a and b are integers we can now solve the equations $x + a = b$, $ay = b$ in all cases. There still remain some arithmetical problems, however, for which rational numbers do not suffice. To find the side of a square whose area is 2 sq. feet is the same thing as to find a number whose square is 2, and it was proved by the Greek geometers, in effect, that no rational x gives $x^2 = 2$. This defect is remedied by the introduction of *irrational*, or *incommensurable*, numbers. Arithmeticians have been in the habit of treating these in somewhat rough and ready fashion, solving $x^2 = 2$, e.g. by writing $x = \sqrt{2}$, and then assuming that this $\sqrt{2}$ can be manipulated in every way like an ordinary rational number. Modern mathematicians, especially Dedekind, Weierstrass, and Cantor, have put the theory of the irrational number on a sound logical basis. The methods of Dedekind and of Cantor may be illustrated by the example of $\sqrt{2}$. Dedekind divides all rational numbers into two classes: (a) those whose squares are less than 2, (b) those whose squares are greater than 2. This mode of division satisfies the conditions: (1) every rational number belongs to one class or the other; (2) every number belonging to the lower class is smaller than every number belonging to the upper; (3) the lower class has no maximum, and the upper class has no minimum. A division, or *section*, of the rational numbers, fulfilling these conditions, defines an irrational number, and Dedekind shows that the ordinary operations of arithmetic can be extended so as to apply to the numbers thus defined. In Cantor's method two *sequences* of rational numbers are considered, e.g.

$$1,\ 1{\cdot}4,\ 1{\cdot}41,\ 1{\cdot}414,\ 1{\cdot}4141,\ \ldots .$$
$$2,\ 1{\cdot}5,\ 1{\cdot}42,\ 1{\cdot}415,\ 1{\cdot}4142,\ \ldots .$$

The numbers in the upper row have squares less than 2, those in the lower row have squares greater than 2, and the difference between corresponding numbers in the two rows becomes as small as we please by going far enough with the sequences. The two sequences define $\sqrt{2}$. It may be shown that one of the sequences by itself is sufficient for the purpose.

Another useful way of viewing an irrational number is to consider its expression as a decimal fraction. We know that the decimal which expresses any rational number either terminates or recurs. A decimal which does neither one nor the other represents an irrational number, and every irrational number can be represented by such a decimal. Whichever definition we take, the results are easily proved to be equivalent. The whole field of numbers definable in any of the three ways is called the arithmetical continuum. It is the domain of the real variable in mathematics.

Irrational numbers originated in problems of geometry, and one of the best ways of obtaining a clear view of their nature is to bring them into relation with the lengths of segments of a line. On a line OX mark off a unit segment OU, and take any point P on the line. The ratio OP/OU may be a rational number, or it may not. If we imagine *all* the points taken, such as P, for which OP/OU is rational, there are still points of the line left out. Any one of these omitted points corresponds to an irrational number, and the whole system of points on the line may be regarded as in exact correspondence with the arithmetical continuum. For imaginary or complex numbers see *Theory of Functions of a Complex Variable*. See *Arithmetic*; *Commensurable*. —BIBLIOGRAPHY: G. Chrystal, *Algebra*; H. S. Carslaw, *Fourier Series and Integrals*; E. H. Hobson, *Theory of Functions of a Real Variable*.

Number, Atomic. It was proved by Moseley (q.v.) that the frequencies of the X-ray spectra of a large number of elements could be represented by the formula $a(\mathrm{N} - b)^2$, where a and b are the same for all the elements, and N is an integer which changes by 1 as we pass from any element to its neighbour in a table of the elements arranged in a certain order, practically the order of their increasing atomic weights. Moseley called N the atomic number of the element. Hydrogen has the atomic number 1, helium 2, lithium 3, and so on, up to uranium, the atomic number of which is 92. It is now generally believed by physicists that the atomic number represents the net number of unit positive charges in the nucleus of the atom. In a neutral atom this is the same as the number of free or planetary electrons outside the nucleus. Helium, e.g., being of atomic weight 4, has four unit positive charges (protons) in its nucleus, but these are combined with two cementing electrons, so that the atomic number is $4 - 2 = 2$; and there are two planetary electrons, the loss of which changes the helium atom into an α-particle. See *Electron*; *Isotopes*; *Matter*; *Radioactivity*; *Rays, Electric*; *Spectra, Theory of*; *X-ray Spectra*; *Periodic Table*.

Numbers, Theory of, a branch of pure mathematics which deals with the properties of positive integers. It is a subject which has been cultivated by some of the greatest mathematicians, more especially by those of the school to which practical application makes little appeal. Some of the chief names are Diophantus, Fermat, Gauss, Legendre, Kummer, Dirichlet, Riemann, Jacobi, Hermite, Cayley. The theory has been carried very far; only a few elementary points can be referred to here. The most important classification of the natural numbers is into primes and composite numbers. The number of primes is infinite. It has been shown that the ratio of the number of primes less than x to $x/\log x$ tends to 1 as x increases indefinitely. The idea of congruence, and of residue, with respect to a modulus (m) is fundamental. If $a - b$ is divisible by m, a and b are congruent; if there is a remainder p, less than m, when a is divided by m, a is said to have the residue p, and we write $a \equiv p \pmod{m}$. If m is a prime, and a prime to m, then $a^{m-1} \equiv 1 \pmod{m}$, (*Fermat's Theorem*). If m is a prime, $(m - 1)! \equiv -1 \pmod{m}$, (*Wilson's Theorem*). There is a theory of congruences, very similar to the theory of algebraic equations. The congruence $ax \equiv b \pmod{m}$ is equivalent to the ordinary *Diophantine* equation $ax - my = b$, where x and y have to be integers. The great master of Diophantine analysis was the French mathematician Fermat (1601–65), whose re-edited works were published at Paris, 1891–4. His famous *Last Theorem* (see *Indeterminate Analysis*) is still unproved, but if there is any value of n, greater than 2, for which $x^n + y^n = z^n$ is soluble in integers, that value must be greater than 7000; so much has been established by the work of innumerable mathematicians. Fermat himself left a marginal note in one of his books distinctly asserting that he had a proof of the theorem, and he has never been convicted of a false assertion, though he once made a wrong conjecture, viz. that $2^m + 1$ is a prime when m is a power of 2; Euler proved that this is wrong when $m = 2^5$.—BIBLIOGRAPHY: G. Chrystal, *Algebra*; L. E. Dickson, *History of the Theory of Numbers*; G. H. Hardy, *Some Famous Problems of the Theory of Numbers*; L. J. Mordell, *Three Lectures on Fermat's Last Theorem*.

Numbers, Book of, the fourth of the books of the *Pentateuch*. It takes its name from the records which it contains of the two enumerations of the Israelites, the first given in chaps. i–iv, and the second in chap. xxvi. It contains a narrative of the journeyings of the Israelites from the time of their leaving Sinai to their arrival at the Plains of Moab, and portions of the Mosaic Law. Formerly the authorship was implicitly attributed to Moses, but some modern scholars resolve the book into various parts, to each of which is assigned a separate author. See *Pentateuch*.

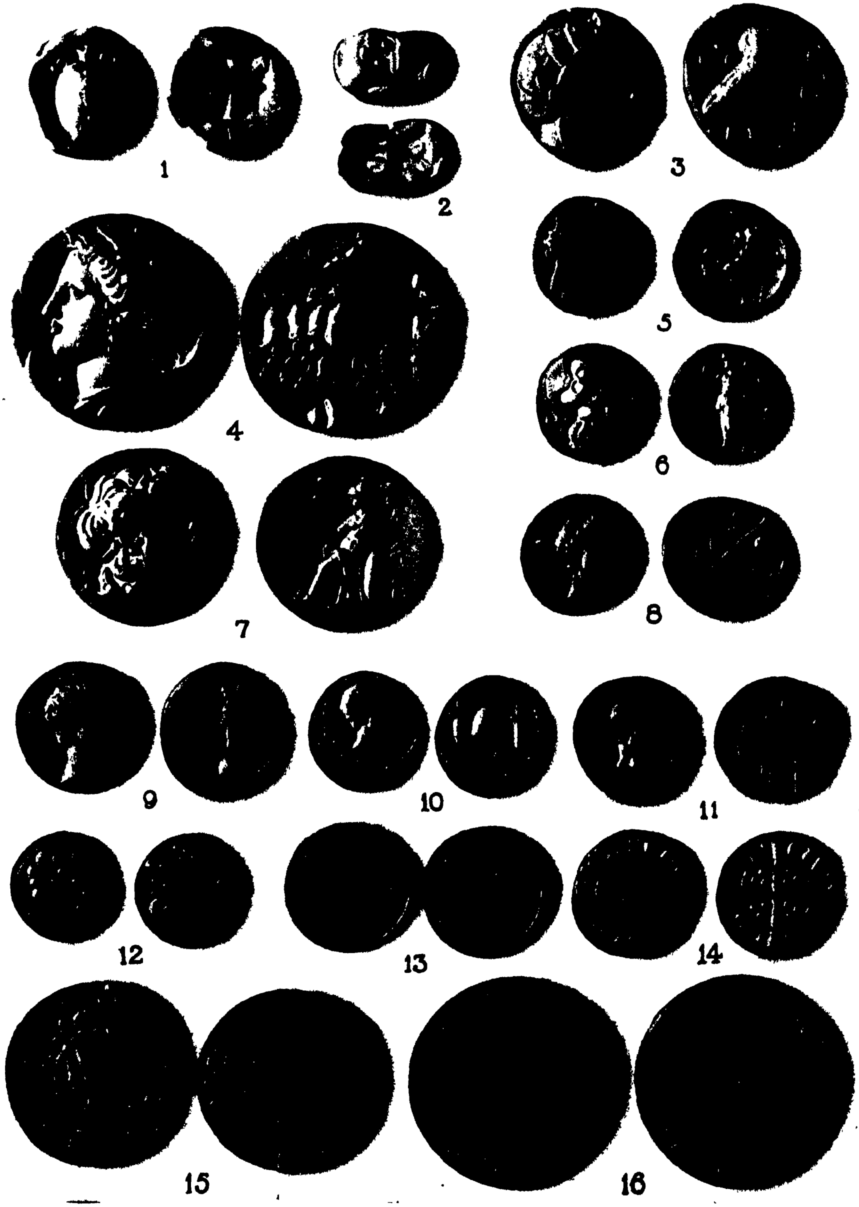
Numidia, a Roman province of North Africa, between Mauretania and Africa, corresponding to the modern Eastern Algeria. The indigenous wandering people were called Nomades by the Greeks, and, Latinized, the name became Numidæ, hence Numidia. They were subdued by the Carthaginians, reunited under Masinissa in 201 B.C., and remained under a native monarchy until 46 B.C., when Juba I allied himself with Pompey and his country was annexed as a Roman province by Julius Cæsar. The Numidians formed light cavalry in both the Carthaginian and the Roman armies.

Numismatics (Lat. *numisma*, a coin) is the study of coins and medals, a branch of archæology, the importance of which is being increasingly recognized by the student of history. The distinction between coins—pieces struck for currency — and medals — purely commemorative pieces—is comparatively modern. The medal as we know it goes back to the fifteenth century; but it is not till a much later date that the word acquired its present specialized meaning. On the other hand, ancient coinages were not so stereotyped as modern ones, and their great value lies in many cases in the commemorative nature of their types. Coins are of use to the student in various ways, though their value must not be exaggerated. Firstly, they tell us that certain towns or rulers issued money. In the majority of cases we are well informed regarding these from other sources. On the other hand, whole dynasties are known only from their coins. The best-known examples are the long series of coins of the Greek kings of India and Bactria who succeeded Alexander the Great. They are quite unknown to history, and but for their coins we should never have known that Alexander's conquest had such a permanent effect in the East. To come nearer home, many kings of the ancient Britons are known only from their coins. A certain amount of geographical information is also obtained; an examination of the find-spots of the coins of a dynasty enables us to get some idea of the extent of its territory. In a few cases we often know of ancient towns from their coins. A good deal of information regarding ancient leagues and alliances has been deduced from coins. Dated series of coins, unfortunately not common in ancient times, are of great value for chronological purposes. In this lies the great value of Mahommedan coins for example. The analysis of finds of coins, by reasoning from the known to the unknown, has yielded much information of real chronological value.

Coin of Alfred the Great

Greek and Roman coins have been of immense value for the study of mythology, as they give much information about local cults and myths, of which we know nothing from other sources.

NUMISMATICS



1, Silver stater of Ægina, seventh century B.C. 2, Gold stater of Crœsus, 568-554 B.C. 3, Tetradrachm of Athens, fifth century B.C. 4, Decadrachm of Syracuse, *c.* 400 B.C. 5, Gold stater of Tarentum, *c.* 340 B.C. 6, Gold stater of Alexander the Great. 7, Tetradrachm of Lysimachus. 8, Denarius of Julius Cæsar, 44 B.C. 9, Denarius of Octavian (Augustus), *c.* 36 B.C. 10, Denarius of Marcus Brutus, 42 B.C. 11, Aureus of Claudius. 12, Anglo-Saxon penny of Offa. 13, Anglo-Saxon penny of Alfred. 14, Penny of Edward I. 15, Half-noble of Edward III. 16. Half-sovereign of Queen Elizabeth.

The importance to the student of art and sculpture of a series of works of art like coins is also very great, because they can be dated and located more accurately than statues. This enables us to classify schools and periods of art. In addition, they preserve representations of statues and buildings now lost. Coins are the most durable of all antiquities, and to them we owe a series of portraits of many great men, whose features would otherwise have remained unknown to us.

Coinage was invented by the Greeks in the eighth century B.C., and independently about the same time by the Chinese. The designs or 'types' of the earliest Greek coins were heraldic in their nature. They were uninscribed, and the type—the seal (*phoce*) at Phocæa, for example—served to identify it. With the development and multiplication of coinages and the use of inscriptions, greater variety of types became possible. Local myths and legends were illustrated, and divine emblems began to appear. Athens early evolved the type of the head of Athena on one side, and her emblem, the owl, on the other. The idea was soon copied, and we have such combinations as Zeus and his thunderbolt, Hercules and his club, &c. By the fourth century B.C. it was the convention to have a deity's head on one side. After the death of Alexander the Great, his deified head was placed on coins by his successors. Soon the rulers of the various dynasties to whom his empire fell deified themselves in their lifetime and put their portraits on their coins, and thus before the beginning of the Christian era a portrait of the reigning monarch had become the natural obverse type of a coin. The first portrait of a living Roman to appear on coins is that of Julius Cæsar. The period of civil war following his death gives many interesting portraits—Brutus, Antony, Cleopatra, &c.—and when Augustus gained the empire he put his portrait on the coins, and the practice henceforth became the regular one. The reverse types gradually become more and more conventional as we approach modern times. It is interesting to note that the penny of George V still shows directly the influence of the Athenian moneyers of the sixth century B.C.—BIBLIOGRAPHY: G. F. Hill, *Handbook of Greek and Roman Coins*; Th. Reinach, *L'Histoire par les monnaies*; G. Macdonald, *Coin Types: their Origin and Development*; B. V. Head, *Historia Nummorum*; S. Lane-Poole, *Coins and Medals*; H. A. Grueber, *Handbook of Coins of Great Britain and Ireland*; E. Burns, *Coinage of Scotland*; J. S. Dye, *Coin Encyclopædia*; G. D. Mathews, *Coinages of the World*.

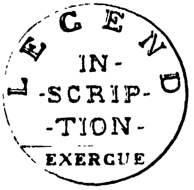
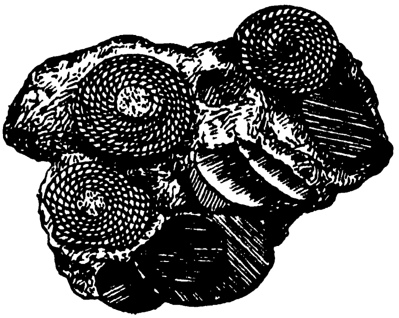


Diagram of the Reverse of a Coin

Nummulite (Lat. *nummus*, money; Gr. *lithos*, stone), a name common to the members of an extensive class of fossil perforate and many-chambered foraminifera, having externally somewhat the appearance of a piece of money (hence their name), and internally a spiral cavity divided by partitions into numerous chambers communicating with each other by means of small openings. They vary in size from less than $\frac{1}{8}$th inch to $1\frac{1}{2}$ inches or more in diameter. Nummulites occupy an important place in geology, on account of the prodigious extent to which they are accumulated in Eocene strata. They are often piled on each other nearly in as close contact as the grains in a heap of corn. They occur so abundantly in some beds that the name of *nummulitic* limestone is given to the strata so characterized. The 'Nummulitic series' is characteristic of the Old World, often attains a thickness of many thousand feet, and extends from the western shores of Europe and Africa through Asia to the east of China. The pyramids of Egypt are constructed of a stone largely composed of nummulites. After a time of great abundance in the Eocene, nummulites sink rapidly in importance, though a small form occurs in modern seas.



Nummulites

Nun, a word of unknown origin, but supposed to be connected with a Coptic word signifying 'pure', applied in the Roman Catholic Church to a woman who retires from the world, joins a religious sisterhood, takes upon herself the vow of chastity and the other vows required by the discipline of her convent, and consecrates herself to a life of religious devotion. Nearly all the orders or rules for men had corresponding institutions for women, while there were also numerous independent orders of nuns. At present the number of nuns is largely in excess of that of monks. The first nunnery is said to have been that founded by a sister of St. Anthony about A.D. 270; and the first in England was founded at Folkestone by Eadbald of Kent in 630.

Nunc Dimittis (' now lettest thou depart '), the first two words of the Latin version of the canticle of Simeon given in *Luke*, ii, 29–32, and used as the designation of the whole canticle, which forms part of the evening service in the *Book of Common Prayer*.

Nun'cio (Lat. *nuntius*, messenger), an ambassador of the first rank (not a cardinal) representing the Pope at the court of a sovereign entitled to that distinction. A Papal ambassador of the first rank, who is at the same time a cardinal, is called a legate. The title of *internuncio* is given to an ambassador of inferior rank, who represents the Pope at minor courts. Formerly the Papal nuncios exercised the supreme spiritual jurisdiction in their respective districts. But now, in those Catholic kingdoms and states which hold themselves independent of the court of Rome in matters of discipline, the nuncio is simply an ambassador.

Nuneaton, a town of Warwickshire, England, on the Anker; served by the Midland and the London & North-Western Railways, and by a canal. Coal-mining is conducted in the vicinity. Cotton, woollen, and woven worsted goods, hats, bricks, tools, and tiles are manufactured. There are ironworks. Nuneaton was formerly a great ribbon-manufacturing town. It originated in a Benedictine house founded in 1150. Pop. (1921), 41,894.

Nupe, a province of Nigeria, on the north of the Niger; area, 6400 sq. miles; pop. (estimated), 200,000. Bida is the capital. Formerly a powerful native state, Nupe came into conflict with the Royal Niger Company in 1897, and the company's troops captured Bida. In 1903 the region came under the direct administrative control of the British Government, but remains under the nominal rule of an Emir.

Nuraghi (nų-rä'gē), the name given to certain ancient structures peculiar to Sardinia, resembling in some respects the ' burghs ' or ' brochs ' (q.v.) found in some of the northern parts of Scotland. They are conical structures with truncated summits, 30 to 60 feet high and 35 to 100 feet diameter at the base, built of unhewn blocks of stone without mortar. They generally contain two or three conically vaulted chambers one above the other, connected by a spiral staircase in the thickness of the wall, and are built either on natural or artificial eminences. Their purpose is not known, but they are probably prehistoric monumental tombs. Diodorus Siculus, relating the traditions of his time, says that these buildings dated from the time of Iolaus, nephew to Heracles.

Nürnberg (nürn'ber*h*), a city in the Republic of Bavaria, on the small River Pegnitz, belonging to the Main basin. It is surrounded by well-preserved ancient walls, which have, however, been breached in several places to afford access from the extensive and rapidly increasing suburbs. Within the walls it is one of the best-preserved specimens of a mediæval town in existence. The Pegnitz, traversing the town from east to west, divides it into two nearly equal parts—the north and the south, which communicate by numerous bridges. It contains a large market-place and several interesting churches, among the finest of which are the Gothic churches of St. Lawrence and St. Sebaldus, both dating from the thirteenth century. The former among other treasures of art contains an elaborate and delicately carved ciborium of stone in the form of a Gothic spire 65 feet high by Adam Krafft; the latter, St. Sebald's monument, the masterpiece of Peter Vischer, consisting of a rich late-Gothic altar shrine and canopy in bronze adorned with numerous statues and reliefs. Other places of worship are the fourteenth-century Marienkirche (Roman Catholic), and the Jewish synagogue in Oriental style (1867–74). The castle dates from the reign of Friedrich Barbarossa (1158); part of the interior was fitted up in Gothic style (1854–6) as a royal residence. The town hall is adorned with frescoes by Albert Dürer, and a relief in stucco by Kern. The Germanic National Museum, founded in 1852 in a suppressed Carthusian monastery, a Gothic building of the fourteenth century with extensive cloisters, and greatly extended by the addition of the Augustinian monastery rebuilt adjoining, now ranks among the first in Germany, and is exceedingly rich in works illustrative of the arts and industries of the Middle Ages. It has also a library and a collection of charters. There are several fountains, the chief of which is the Schöne Brunnen, erected between 1385 and 1396, and restored between 1821 and 1824, in the form of a graceful Gothic cross 63 feet in height, adorned with numerous figures. There are modern statues of Dürer, Hans Sachs, Melanchthon, and other celebrities. The town library contains 80,000 volumes, and educational institutions are numerous. Nürnberg has extensive breweries, railway-carriage and lead-pencil manufactories, and produces fancy articles in metal, carved wood, ivory, &c., toys, chemicals, clocks and watches, cigars, playing-cards, &c. Printing and bookbinding are also extensively carried on, and the hop-market is the most important on the Continent. The town is celebrated, in connection with its industry, for the invention of watches.

Nürnberg was an independent imperial town down to 1806, when it became a Bavarian city.

It was one of the first of the imperial towns to cast its lot for the Reformation. During the Thirty Years' War about 10,000 of the inhabitants perished, while Gustavus Adolphus was besieged here by Wallenstein (1632). Before the discovery of the sea-passage to India, Nürnberg was the great mart of the produce of the East coming from Italy and going to the North. Several causes led to a decline; but since it became a Bavarian city it has prospered greatly. Pop. (1919), 352,679.

Nursery. In its application to gardening and forestry the term nursery means an establishment or place for the propagation of plants by means of seeds, cuttings, grafts, &c. Commercially a nursery is a plant emporium, often of considerable importance, and the term nurseryman is synonymous with plant dealer or trader. In all civilized countries there are nursery gardens where plants likely to be in demand are stocked for sale, and the proprietors often render valuable service by introducing and propagating for subsequent distribution plants from other countries which may prove useful either decoratively or economically. In its more limited meaning, the term is used for any portion of a garden or forest that is set apart for the rearing of plants. Many large private gardens have a nursery in this sense. The art of raising plants from seeds and by the various artificial methods in use in gardening and arboriculture is a special one. A man may be a good cultivator without possessing a knowledge of this art. Consequently when he needs fresh stock he applies to a nurseryman, in the belief that he can supply it in the right condition for becoming established and a success. It is the business of the nurseryman therefore to discover by experiment whether a new introduction will thrive best on its own roots, or as a grafted plant. There are numerous cases in which climatic or other obstacles have been surmounted by grafting, and others in which layering has to be resorted to for success. All this is the work of the propagator, who is indispensable to the nurseryman; in fact, the nursery business is based on skilful propagation, and the horticulture of a country is very largely dependent on the quality of the productions of the nursery. But a nursery in its modern development is more than a garden for the raising of young stock. In his position as an introducer and dealer the nurseryman has extended his operations to those of a cultivator of well-grown examples of his wares, and a nursery may contain superb specimens of many kinds of plants which equal and often surpass the best to be found in other establishments. Thus a well-appointed nursery is an excellent school of gardening in its various phases. It is in a position to supply not only young plants properly prepared for growing on in the garden, but also well-developed specimens, ready made as it were, together with experts trained in all the arts of cultivation. Modern horticulture is greatly indebted to the enterprise and skill of the nursery proprietor.

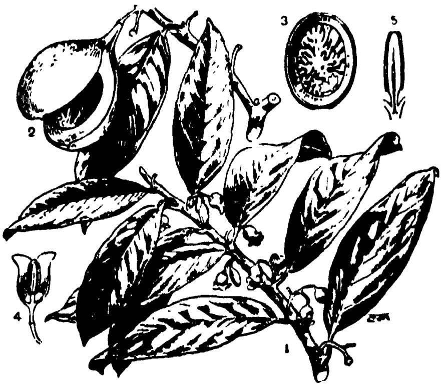
Nut, in botany, a one-celled fruit containing when mature only one seed, and enveloped by a pericarp of a hard, woody, or leathery texture, rarely opening spontaneously when ripe. Among the best-known edible nuts are the hazel-nut, the Brazil-nut, the walnut, chestnut, and coconut. Valonia-nuts, gall-nuts, and myrobalan-nuts are used in tanning and dyeing, the last two also in ink-making; betel-nuts in making tooth-powder and tooth-paste; and coquilla-nuts and vegetable-ivory (the kernel of the nut of the ivory-palm, q.v.), being very hard and capable of taking on a fine polish, are used in making various small articles. Of the examples mentioned several, such as the walnut and coco-nut, are not nuts in a botanical sense.

Nutation, in astronomy, a small subordinate gyratory movement of the earth's axis, due mainly to the attraction of the moon. There is also an extremely small annual nutation, due to the sun. The lunar nutation has a period of about nineteen years, depending on the revolution of the lunar nodes, and in virtue of it the pole would describe among the stars, in a period of about nineteen years, a minute ellipse, having its longer axis directed towards the pole of the ecliptic. The consequence of this real motion of the pole is an apparent approach and recession of all the stars in the heavens with reference to the pole in the same period; and the same cause gives rise to a small alternate advance and recession of the equinoctial points, by which, in the same period, both the longitudes and right ascensions of the stars are also alternately increased and diminished. Nutation, however, operates only as a modification of a much larger and progressive motion of the pole, viz. the precession of the equinoxes, and in virtue of the two motions the path which the pole describes is a gently undulating curve, the undulations constituting a nutation or 'nodding' of the earth's axis. Both these motions arise from actions of the sun and moon upon the equatorial protuberance of the earth. See *Precession*.

Nut'cracker, the name of a perching bird rarely seen in Britain. It belongs to the crow family (Corvidæ). The *Nucifrăga caryocatactes*, or European nutcracker, is about the size of the jackdaw, but with a longer tail. It combines to a considerable extent the habits of the woodpeckers and those of the omnivorous birds. It has received the name of nutcracker from its feeding upon nuts. The allied form *Picicorvus* *columbianus*, noted for the diversified beauty of its plumage, frequents rivers and seashores in America.

Nut'hatch, the common name of birds of the family Sittidæ. The common European nuthatch (*Sitta cæsia*) is a climbing bird, of shy and solitary habits, frequenting woods and feeding on insects chiefly. It also eats the kernel of the hazel-nut, breaking the shell with great dexterity. The female lays her eggs in holes of trees, and hisses like a snake when disturbed.

Nuthatch (*Sitta cæsia*)



Nutmeg (*Myristica moschāta*)

1, Leaves and flowers. 2, Fruit. 3, Section of nut. 4, Section of flower. 5, Section of stamen and anther.

Nutmeg, the kernel of the fruit of *Myristica moschāta* or *fragrans*. This fruit is a nearly spherical drupe of the size and somewhat of the shape of a small pear. The fleshy part is of a yellowish colour without, almost white within, and four or five lines in thickness, and opens into two nearly equal longitudinal valves, presenting to view the nut surrounded by its arillus, known to us as *mace*. The nut is oval, the shell very hard and dark brown. This immediately envelops the kernel, which is the nutmeg as commonly sold in the shops. The tree producing this fruit grows principally in the Islands of Banda in the East Indies, and has been introduced into Sumatra, India, Brazil, and the West Indies. It reaches the height of 20 or 30 feet, producing numerous branches. The colour of the bark of the trunk is a reddish brown; that of the young branches a bright green. The nutmeg is an aromatic, stimulating in its nature, and possessing narcotic properties. It is much used in cookery. Nutmegs yield by distillation with water about 6 per cent of a transparent oil consisting chiefly of myristicene ($C_{10}H_{16}$), and having an odour of nutmeg, and a burning, aromatic taste.

Nutrition, the act or process by which organisms, whether vegetable or animal, are able to absorb into their system their proper food, thus promoting their growth or repairing the waste of their tissues. It is the function by which the nutritive matter already elaborated by the various organic actions loses its own nature, and assumes that of the different living tissues, i.e. is assimilated—a process by which the various parts of an organism either increase in size from additions made to already formed parts, or by which the various parts are maintained in the same general conditions of form, size, and composition which they have already by development and growth attained. It involves and comprehends all those acts and processes which are devoted to the repair of bodily waste, and to the maintainance of the growth and vigour of all living tissues. See *Aliment*; *Foods and Food Values*.

Nux-vomica, the fruit of a species of Strychnos (*S. nux-vomica*), ord. Loganiaceæ, growing in various places in the East Indies. It is about the size and shape of a small orange, and has a very bitter acrid taste. It is known as a very virulent poison, and is remarkable for containing the alkaloid, strychnine.

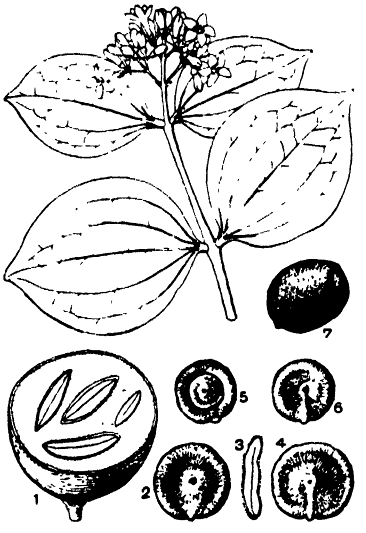
Nuytsia, a genus of Australian trees, remarkable within their nat. ord. (Loranthaceæ) in not being parasitic. *N. floribunda* is the flame tree of Western Australia, so called on account of its brilliant orange-red flowers.

Nyasa, Lake, the third largest lake of Africa, long and narrow, occupying a depression in the floor of the Great Rift Valley; length, about 300 miles; breadth, from 15 to 60 miles; altitude, 1565 feet. It is drained by the Shiré River flowing to the Zambezi, and is fed by the Bua, Rukuru, Songwe, and other rivers. The water is fresh, and the level is variable. Fort Johnston, at the extreme southern end, and Karonga are the principal ports.

Nyasaland, formerly **British Central Africa**, a British Protectorate, forming a narrow strip of territory 520 miles long and from 50 to 100 miles broad, lying along the southern and western shores of Lake Nyasa.

Area, &c.—Area, 39,753 sq. miles, divided into 15 districts, each under a Resident. Pop. (1920), 1,202,208 natives, 515 Asiatics, and 1015 Europeans (residing mainly in the Shiré Highlands).

Physiography.—Running from north to south is one of the southern extensions of the Rift Valley (which extends from Palestine to Beira). Between the eastern edge of the Angoni Plateau and the western shore of the lake there is a narrow coastal strip, from 10 to 20 miles wide, carrying an enormous native population. This strip varies from 1565 feet (the level of Lake Nyasa) to 2000 feet in altitude. The Angoni Plateau varies in altitude between 4000 feet and 8597 feet. To the west of the lake, Nyasaland is mountainous. The white population is located on the Shiré Highlands Plateau, about 80 miles long by 25 miles wide, most of which is above 3000 feet in altitude (Zomba, 6647 feet). South of Lake Nyasa is Lake Shirwa, without an outlet, of varying area and entirely unnavigable. South of this lake is the Mlanje tableland (culminating point, 9846 feet), in the valleys of which is found the Mlanje cedar.



Nux-vomica (*Strychnos nux-vomica*)

1, Section of fruit. 2, Seed (Ceylon). 3, Section of 2. 4, Same seed showing ridge. 5, Seed (Madras). 6, Same seed showing ridge. 7, Seed of *Strychnos ignattii.*

Transport.—Shiré River is the most important river of Nyasaland. It emerges from Lake Nyasa, flows in a southerly direction to the Zambezi, which it joins below Chindio; length, 275 miles, the lower 50 miles being in Mozambique (Portuguese). The central part of the river is interrupted by the Murchison cataracts, but until the Lower Shiré became unnavigable it formed practically the only approach to Nyasaland from the outside world. Roads are classified as wagon roads, main roads, or carrier roads, and cover about 3500 miles, but few are metalled, excepting one from Blantyre, via Zomba, to Liwonde and Fort Johnston, used during the European War as a supply-line for the Northey column operating in the then German East Africa. A railway runs from the Zambezi to Blantyre, 129 miles in all, of the standard South African gauge—3 feet 6 inches.

Towns.—Trade ports are: Port Herald (Lower Shiré), Kota-Kota, Karonga, and Fort Johnston on Lake Nyasa. Chinde, at the mouth of the Zambezi, is held by Nyasaland on a ninety-nine years' lease (dating from 1892), and is exempt from Portuguese taxes, &c., but the Trans-Zambezia Railway (see *Zambezia*) has practically killed the harbour and trade of Chinde. Zomba is the seat of government; Blantyre (Shiré Highlands) is the chief settlement; other towns are: Mlanje and Limbe, and (on Lake Nyasa) Bandawe, Chintechi, Nkata, and Likoma.

Social Conditions.—The indigenous population is of Bantu-Negro stock, divided into ten groups. Among languages are Swahili, Chinyanja, and Yao. Native education is in the hands of missionaries. There are no schools.

Production: Agriculture.—Nyasaland is devoted almost entirely to agriculture, cotton, tobacco, and tea being the principal products. Coffee, hemp, and rubber are subsidiaries, all in order of importance. Both mauritius- and sisal-hemp are grown. Wild landolphia rubber was formerly one of the staple exports, but has now been replaced by planted rubber (Ceara and Para). Rice is cultivated by the natives along the lake shore; oranges, lemons, pineapples, bananas, mangoes, paw-paws, loquats, guavas, and grenadillas flourish over the major portion of the Protectorate; apples, peaches, pears, and strawberries do well in the highlands. The climate is not suitable for horses, and cattle-rearing is not extensive through the menacing *tse-tse* fly.

Forestry.—The cypress forests of Mount Mlanje are the only important forest resources, although there are sporadic growths of African mahogany (*Khaya Senegalensis*), or *Mbawa.*

Minerals.—Nyasaland is not rich in minerals, although mica has been exported from the Dedza region. Coal has been located near the Shiré River, and the existence is reported of graphite, plumbago, garnets, copper, mercury, gold, asbestos, and iron ore, but not in paying quantities.

History.—In 1859 David Livingstone discovered Lake Nyasa, and two years later missionaries settled at Zomba. By the Anglo-German Treaty of 1st July, 1890, respective German and British spheres were fixed, and a British Protectorate was proclaimed on 14th May, 1891. In 1893 the territory became the British Central Africa Protectorate, but the present nomenclature (Nyasaland Protectorate) was introduced in 1907. On the outbreak of the European War both British and German forces rapidly mobilized, and each endeavoured to strike the first blow. On 22nd Aug. the British force was concentrated at Karonga, equipped and ready for action. On Lake Nyasa the Germans placed an armed steamer (*Hermann von Wissmann*), which the British steamer *Gwendolen* dismantled in harbour at Sphinxhaven (13th Aug. 1914), thus opening the campaign and ensuring to the British the command of the lake. By land the Germans concentrated at New Langenburg, advanced (20th Aug.) across the Songwe River, seized Kapora, and on 8th and 9th Sept. were completely routed at Karonga. In May, 1915, a naval detachment captured Sphinxhaven.

Government. — Nyasaland is administered for the Colonial Office by a Governor and Commander-in-Chief, assisted by nominated Executive and Legislative Councils.

BIBLIOGRAPHY: E. Dane, *British Campaigns in Africa and the Pacific, 1914–1918*; D. J. Rankin, *The Zambezi Basin and Nyasaland*; Sir H. H. Johnston, *British Central Africa.*

Nyborg, a seaport on the east of the Island of Fünen, Denmark, connected by rail with Odense, and by steamer with Korsör, on Zeeland. It was founded in 1170, and was one of the foremost Danish towns of the Middle Ages. Pop. 8470.

Nyctagina'ceæ, or **Nyctagin'eæ**, a natural order of plants inhabiting the warmer parts of the world, typical genera of which are the Mirabilis or marvel of Peru (see *Mirabilis*), Abronia, and Pisonia. The roots of many of the species are fleshy, purgative, and emetic.

Nyctalopia. See *Night-blindness.*

Nyctanthes, a genus of shrubs or small trees, ord. Oleaceæ. *N. Arbor tristis* is the night-flowering jasmine or sad tree of India, the sweet-scented flowers of which open in the evening and fall off about sunrise.

Nyiregyhaza (nyi-red'yė-hă-zȧ), a town and railway junction of Hungary. There are mineral springs in the neighbourhood, and it has salt, soda, and saltpetre manufactories. Pop. 38,198.

Nyköping (nü-cheup'ing), a seaport town of Sweden, capital of the län of Södermanlän, and at the mouth of the River Nyköping, on the Baltic. It has shipbuilding and several minor industries. Pop. (1920), 11,460.

Nylghau, the *Boselaphus tragocamĕlus*, a species of antelope as large as or larger than a stag, inhabiting the forests of Northern India, Persia, &c. The horns are short and bent forward; there is a beard under the middle of the neck; the hair is greyish blue. The female has no horns.

Nylghau (*Boselaphus tragocamĕlus*)

The nylghau is much hunted as one of the noblest beasts of the chase, the skin of the bull being in demand for the manufacture of native shields. The name nylghau literally means ' blue ox ', and has, doubtless, been applied to this animal from the ox-like proportions of its body. They are known to breed freely in confinement.

Nymph, a larval insect differing from the adult only as regards size and absence of wings.

Nymphæa'ceæ, a natural order of aquatic plants containing the water-lilies of various parts of the world. They are polypetalous hypogenous exogens, with the sides of the cells of the fruit covered with numerous seeds. The leaves are peltate or cordate and fleshy; the stalks both of flowers and leaves vary according to the depth of the water on the top of which the leaves float. The stems are bitter and astringent, and the seeds, which taste like those of the poppy, may be used as food, and hence the *Victoria Regia* is called water-maize in South America. The species are mostly prized for the beauty of their flowers; as the *Nymphæa alba*, or white water-lily, which grows in pools, lakes, and slow rivers in Britain; the *N. cærulea*, or blue lotus of the Nile, often cultivated in gardens; the *N. Lotus*, or white lotus of the Nile; the *Nuphar lutĕum*, or yellow water-lily; and the *Victoria Regia.*

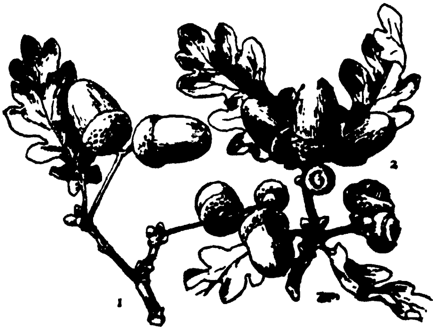
Nymphs, in mythology, a numerous class of inferior divinities, imagined as beautiful maidens, not immortal, but always young, who were considered as tutelary spirits not only of certain localities, but also of certain races and families. They occur generally in connection with some other divinity of higher rank, and they were believed to be possessed of the gift of prophecy and of poetical inspiration. Those who presided over rivers, brooks, and springs were called *Naiads*; those over mountains, *Oreads*; those over woods and trees, *Dryads* and *Hamadryads*; those over the sea, *Nereids*.

Nystad (Fin. *Uusikaupunki*), a town and seaport of Finland, on the Gulf of Bothnia. A peace was concluded there between Russia and Sweden in 1721, and gave Russia large Baltic territories, her ' window to Europe '. Pop. 5000.

O

O, the fifteenth letter and the fourth vowel in the English alphabet. In English O represents six or seven sounds and shades of sound: (1) as in *note*, *go*, &c. (2) The similar short sound as in *tobacco*. (3) The sound heard in *not*, *gone*. (4) The same sound lengthened as in *mortal*. (5) The sound in *move*, *do*, *tomb*, *prove*. (6) The same sound but shorter as in *wolf*, *woman*. (7) The sound of *u* in *tub*, as in *come*, *done*, *love*. It is also a common element in digraphs, as *oo*, *oa*, *ou*.

Oak, the general name of the trees and shrubs belonging to the genus Quercus, nat. ord. Cupuliferæ, having monœcious flowers, those of the males forming pendulous catkins, those of the females solitary or in clusters, and having an involucre which forms the well-known ' cup ' of the fruit—the acorn. The oak from the remotest antiquity has obtained a pre-eminence among trees, and has not unjustly been styled the ' monarch of the woods '. In the traditions of Europe and a great part of Asia the oak appears as a most important element in religious and civil ceremonies. It was held sacred by the Greeks and Romans, and no less so by the ancient Gauls and Britons. The species of oak are very numerous, generally natives of the more temperate parts of the northern hemisphere, but found also in Java, Mexico, and South America. They have alternate simple leaves, which are entire in some, but in the greater number variously lobed and sinuated or cut; evergreen in some, but more generally deciduous. The British oak (*Q. Robur*) is found in two forms or varieties, by some regarded as distinct species —*Q. sessiliflōra* and *Q. pedunculāta*; the wood of the former is heaviest and toughest, that of the latter being in favour with cabinet-makers for ornamental work. (See *Durmast*.) For more than a thousand years British ships were mainly built of common oak (*Q. Robur*). The common oak attains a height of from 50 to 100 feet or even 150 feet, with a diameter of trunk of from 4 to 8 feet. Noble specimens of oak trees, and some of them historically celebrated, exist in almost all parts of Britain, but are much more frequent in England than in Scotland. The oak subserves a great number of useful purposes, the wood being hard, tough, tolerably flexible, strong without being too heavy, and not readily penetrated by water. Among the other chief species are the black American oak (*Q. nigra*); the white or Quebec oak (*Q. alba*); dyer's oak



British Oak

1, *Quercus pedunculāta*, acorns scattered and on obvious peduncle. 2, *Quercus sessiliflōra*, acorns sub-sessile, crowded, and on a condensed peduncle.

North American White Oak (*Quercus alba pennatifida*)

(*Q. tinctoria*), the bark of which is used for tanning and dyeing leather; red oak (*Q. rubra*); the cork oak (*Q. Suber*); live oak (*Q. virens*); the Turkey oak (*Q. Cerris*), furnishing a valuable timber; the valonia oak (*Q. Ægilops*), whose acorn-cups are largely used in tanning; the kermes oak (*Q. coccifĕra*); the edible oak (*Q. æscŭlus*), yielding edible acorns; and evergreen oak (*Q. Ilex*). The bark of the common oak tree and of several others is preferred to all other substances for the purpose of tanning, on account of the amount of tannic and gallic acid it contains. Oak galls, morbid growths caused by insects (see *Galls*), are also much used in tanning, especially those of *Q. infectoria*. Oak bark is also used medicinally as an astringent. The name oak is sometimes popularly applied to timber of very different genera of trees; thus African teak is often called *African oak*; while in Australia the term oak is applied to some species of Casuarina. What is known as *green oak* is a condition of oak-wood caused by its being coloured with the spawn of *Pezīza ærugināsa*, a species of fungus.

American Red Oak (*Quercus rubra*)

Oak-beauty, the popular name of a British moth (*Amphydasis prodromaria*), whose caterpillar feeds on the oak.

Oakham, the county town of Rutland, England, situated in the Vale of Catmos, and served by the Midland Railway. It has a fine old church, a castle built in the twelfth century, and a grammar school. Pop. (1921), 5999.

Oakland, a city of California, United States, the county seat of Alameda county, opposite San Francisco and on the east side of San Francisco Bay; served by the Atchison, Topeka, & Sante Fé, the Ogden branch of the Southern Pacific, and other railways. It is a residential city, but has some shipbuilding, fruit-canning, flour-milling, and other industries. Oakland was incorporated in 1852, and became a city in 1854. Pop. (1920), 216,360.

Oak-leaf Roller (*Tortrix viridiāna*), a small moth which is very destructive to trees and takes its name from the fact that the larvæ roll themselves up in the oak leaves, which give them both food and shelter. The front wings are bright green with a yellowish front edge, but the prevailing colour is greyish brown.

Oakum is the name given to vegetable fibre which is obtained by the disintegration of old tarred or untarred ropes, the fibre from the latter being known as white oakum. A considerable quantity of oakum picking is done in prisons, and the resulting teased fibre is used for caulking the seams of ships, bolt-holes, joints of various kinds, and, in general, for preventing leaks.

Oa'maru, a seaport of South Island, New Zealand, on the railway from Dunedin. Grain and wool are exported and meat is chilled. Limestone of exceptional building utility from the vicinity was used in erecting the town. Pop. 5000.

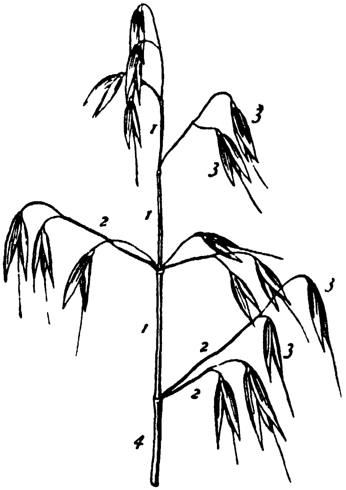
Oan'nes, the name of the Babylonian sea-god, mentioned in the fragments of Berosus. He is described as having the head and body of a fish, to which were added a human head and feet. In the daytime he lived with men to instruct them in the arts and sciences, but at night retired to the ocean.

Oar, a long piece of timber, flat at one end and round at the other, used to propel a boat, barge, or galley through the water. The flat part, which is dipped into the water, is called the *blade*; the other end is the *handle*; and the part between the two is called the *loom*. Oars are frequently used for steering, as in whaleboats. *Sweeps* are large oars used in small vessels sometimes to assist the rudder, but usually to assist the motion of the ship in a calm. A *scull* is a short oar of a length such that one man can manage two, one on each side.

Oar-fish (*Regalĕcus banksii*), one of the ribbon-fishes, a peculiar deep-sea fish, 12 to 20 feet or more in length, but having a narrow and extremely compressed body. It is of a silvery colour, and is only rarely met with, usually in a dying condition. A much smaller Indian species (*R. russelli*) possesses a narrow rod-shaped body.

Oa'sis, a fertile place in a desert. The oases of Northern Africa are generally river valleys, the waters of which are for the most part underground, or depressions surrounded by short ranges of hills, from which small brooks descend, sometimes forming a lake in the centre. In ancient times the most celebrated oasis was that to the west of Egypt, containing the temple of Jupiter Ammon, now called the Oasis of Siwah. Oases have been formed by sinking artesian wells (q.v.).

Oat, or Oats (Avĕna), a genus of edible grasses cultivated extensively in all temperate climates, and, though principally grown as food for horses, largely used when ground into meal as human food. There are about sixty species, the principal of which are: *A. satīva* (the common oat); *A. nuda* (naked oat, pilcorn, or peelcorn); *A. orientālis* (Tartarian or Hungarian oat); *A. brevis* (short oat); *A. strigōsa* (bristle-pointed oat); *A. chinensis* (Chinese oat); &c. The cultivated species of oats are subdivided into a large number of varieties, which are distinguished from each other by colour, size, form of seeds, quality of straw, period of ripening, adaptation to particular soils and climates, and other characteristics. The yield of oats varies from 20 bushels to 80 bushels per acre according to soil, &c. The weight per bushel varies from 35 to 45 lb., and the meal product is about half the weight of the oats. Oatmeal is a cheap and valuable article of food, and its value seems to be becoming more appreciated among the wealthier classes as it is being neglected by the poorer. The wild oat (*A. fatua*) is supposed to be the original of all the species, but its native country is unknown.



Panicle Ear of Cultivated Oat

1, Axis of ear. 2, Branches of this axis. 3, Spikelets. 4, Stalk of ear.

Oates (ōts), Titus, British perjurer and conspirator, born in London about 1649, died 1705. He took orders in the Church of England, became a chaplain in the navy, and was discharged for misconduct. In 1677 he turned Roman Catholic, and resided for some time at the Jesuit Colleges of Valladolid and of St. Omer, but was dismissed for repeated misdemeanours in 1678. He returned to England and concocted the story of the famous 'Popish Plot'. He revealed fictitious details of the plot to Sir Edmund Berry Godfrey, and for some time was lodged handsomely in Whitehall, and received a pension of £900 from Parliament. The effects of this perjury continued for two years until, after the execution of Stafford, there was a revulsion of public opinion. Convicted of perjury, he was sentenced to be pilloried five times a year, whipped from Aldgate to Newgate, and imprisoned for life. On the accession of William and Mary he was liberated, and lived to a bad old age, enjoying an ill-deserved pension of £300 a year. Oates is introduced by Sir Walter Scott into *Peveril of the Peak*, where he is made to speak a peculiar dialect.

Oath, a solemn assertion or promise, with the invocation of God to be a witness of the truth of what we say, hence at the end of the judicial oath, "So help me God". Various forms have been associated with oath-taking. Thus, men have proclaimed and symbolized their promise by chopping a fowl in two, by standing within a circle of rope, by placing the hand under another's thigh, by dipping weapons into or drinking blood, or by stretching the hand upwards in the direction of the sky. Amongst the early Christians the question of oath-taking was a matter of much controversy, objection to it being founded upon Christ's command of "Swear not at all" (*Matt.* v, 34); but this injunction was held by Athanasius and others only to prohibit colloquial as distinct from judicial swearing. This objection is still maintained, however, by Mennonites, Quakers, and Anabaptists; and the Secularists in England, upon other grounds, refuse the judicial oaths. Roman Catholics believe that the Pope has authority to release a person from any obligation into which he has entered, even when he has bound himself by an oath. By the law of England (applying also to Scotland) an oath of allegiance must be taken by the chief officers of State, judges, justices, members of Parliament, &c. Since 1888, however, members of Parliament are allowed to affirm. The chief officers of State are required to take in addition an official oath well and truly to serve the sovereign in the office upon which they are entering, and judges to take a judicial oath. Jurors are required to take an oath that they will perform their functions honestly; and witnesses were formerly required to take an oath, but now, in all cases where the party objects on the ground that he has no religious belief or that the taking of the oath is contrary to his religious belief, an affirmation is permitted. Until 1909 the English practice in judicial oath-taking was to kiss the New Testament, but by the Oaths Act of that year the party taking the oath now holds the book in his uplifted hand. The administering of unlawful oaths in Britain is an offence punishable by penal servitude.

Oaxaca, or **Oajaca**, a maritime state of Southern Mexico, traversed by spurs of the Sierra Madre. Cocoa, coffee, sugar, and tobacco are raised. Oaxaca is the capital. Area, 35,689 sq. miles; pop. (estimated), 1,250,000.

Oaxaca, or **Oajaca**, a town of Mexico, capital of the state of Oaxaca, and on the railway to Mexico City. It has a cathedral and some museums and institutes. In the vicinity was Naxyaca, anciently the capital of the Zapotecas. Pop. about 39,000.

Obadi'ah, one of the twelve minor prophets, who foretells the speedy ruin of the Edomites. The prophecy was probably uttered during the period which elapsed between the fall of Jerusalem (586 B.C.) and the conquest of Edom by Nebuchadnezzar (583 B.C.).

O'ban, a municipal burgh, seaport, and watering-place of Argyllshire, Scotland; served by the Caledonian and North British Railways. It is the tourist head-quarters of the Western Highlands, the terminus of the railways, and the starting-point of the steamers. There is a Roman Catholic cathedral. Dunstaffnage and Dunolly Castles (ruined) are in the vicinity. Pop. 6344.

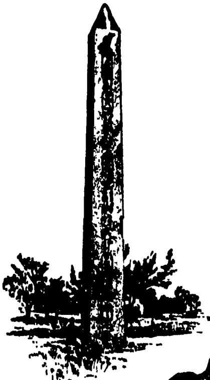
O'be, or **O'bi**, a river of Siberia, rising in the Altai Mountains. It pursues a circuitous course north-west to Samarova, where it bifurcates, both branches falling into the Gulf of Obi; length, 2000 miles. Its chief tributaries are the Irtish, Tobol, Tom, and Tchulim—all, like the main river, important water-ways.

Obe'ah, or **Obi**, a species of witchcraft practised among negroes of the West Indies. The practiser of this form of superstition is called an Obeah-man or -woman, and possesses great influence.

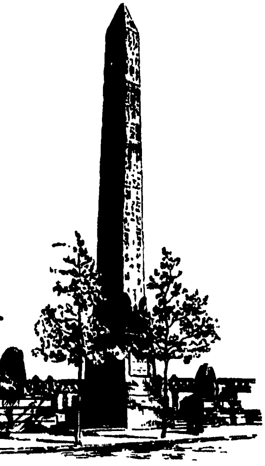
Obeïd, Al-, the capital of Kordofan, Sudan, on a plain (about 2000 feet altitude) to the north of the Jebel Kordofan. It is a place of transit on the Darfur-Egyptian trade route, and is the centre of the *Bedeira*, one of the most important tribes of Kordofan. A railway, built 1909–11, connects it with Khartoum.

Al-Obeïd was taken by the Mahdi (from the Egyptians) in 1883 after a year's siege, and was razed during the Dervish Empire. In 1899, during the advance of Kitchener, and the riverain armies, Al-Obeïd fell to the Sirdar's forces, and was subsequently rebuilt.—Cf. W. S. Churchill, *The River War*.

Ob'elisk (Gr. *obeliskos*, diminutive of *obelos*, a spit), a term applied to stone monuments of a rectangular form, diminishing towards the top, generally terminating in a low pyramid. The proportion of the thickness to the height is nearly the same in all obelisks, that is, between one-ninth and one-tenth; and the thickness at the top is never less than half, nor greater than three-quarters of the thickness at the bottom. Structures resembling obelisks have been discovered in Assyria, in the ruined cities of Nineveh and Nimrud, but the obelisks proper were peculiar to Egypt, and the country abounded with them. They were all monoliths, and varied in height. Many of these obelisks have been removed thence to Rome and other places. They seem to have been erected to record the honours or triumphs of the monarchs. The two largest obelisks were erected by Sesostris in Heliopolis; the height of these was 180 feet. They were removed to Rome by Augustus. A fine obelisk of Rameses II was brought from Luxor to Paris in 1833, and the two known as Cleopatra's Needles are now in London and New York. The obelisks which were common to Rome, Florence, &c., had all been removed from Egypt during its domination by the Roman emperors.—Cf. H. H. Gorringe, *Egyptian Obelisks*.



Obelisk of Usertesen I, On (Heliopolis)



Cleopatra's Needle, London

Oberam'mergau, a village of Upper Bavaria, in the valley of the Ammer; served by electric railway from Munich. It is famous as the home of the Passion Play, which took place periodically from 1634 until 1910. It was usually performed at intervals of ten years, but was performed in 1922 instead of 1920 owing to the aftermath of the European War. The village was once an important trade centre, but is now devoted entirely to agriculture and wood-carving. There is a Benedictine monastery (of Ettal), founded in 1333, dissolved in 1803, and rebuilt in 1884. Pop. nominally about 1000.

Oberhausen, a town of Germany, in Prussian Rhineland, on the Rhine, and a junction on the Wesel-Emmerich and Köln-Hamburg Railways. It is a centre of the iron industry, the Gutehoffnungs-Hütte iron- and steel-works employing over 24,000 hands. There are also coal-mines, and glass-, porcelain-, and chemical-factories. Pop. (1919), 98,670.

O'beron, in folklore, the king of the elves or fairies, and husband of Titania. He appears first in the old French poem *Huon de Bordeaux*, but is best known from Shakespeare (*Midsummer Night's Dream*) and from Weber's opera *Oberon*. Oberon is also the subject of an epic by Wieland, and of a masque by Ben Jonson (*Oberon, the Faery Prince*).

Object, in philosophy, the correlative of subject, a term used to represent the distinction between the mind, or agent, or conscious being, or whatsoever it is conceived to be that thinks (the subject), and that, whatsoever it is, that is thought of (the object). The terms subject and object were first introduced in their modern relation in scholastic philosophy, and the distinction between them was at first merely logical. Thus the mind in the act of forming a particular thought or conception was called the subject of that thought, whilst that to which the thought referred was called the object. The mind might thus be its own object. Modern philosophers have developed this distinction so that the agent in thought is permanently styled the subject, while that about which it is occupied is the object.

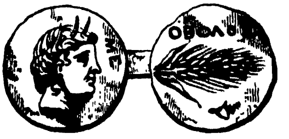
Obla'ti, or **Oblates**, a name given from an early period in the Roman Catholic Church to children dedicated to the Church, and now applied to such persons as associate themselves like monks or nuns but without taking vows. Under the name of Oblati of St. Ambrose a congregation of secular priests was established at Milan in 1578 by St. Charles Borromeo. The Oblates of Mary Immaculate, or of the Immaculate Conception, were founded in 1815, at Aix, by the Abbé Mazenod. Their duties were to consecrate themselves to spiritual ministrations, especially to the young, to the poor, and to prisoners. The order has houses or missionary establishments in France, England, Scotland, and the United States.

Obligation is a term in law which describes the bond under which a person binds himself to pay within a certain time and in the breaking of which a penalty is involved; or the tie in general by which a person is legally bound to the performance of anything.

Oboe (ō'bō), a musical wind-instrument resembling a clarionet in shape, and sounded through a double reed. It consists of three joints besides the mouthpiece, and its compass is generally from B below the treble clef to F in alt, with the intermediate semitones, being a compass of two octaves and one fifth. The name oboe is from the Italian; the French form, *hautboy* (*hautbois*), was formerly more frequently used.

Obok (Fr., *Obock*), a port on the Red Sea, opposite Jibuti, included in the French Somali Coast Protectorate. It was formerly an independent sultanate, but was acquired by the French in 1856, officially annexed in 1862, and occupied in 1884.

Ob'olus, an ancient Greek silver coin, the sixth part of an Attic drachma, equal to 1½*d.*; multiples and sub-multiples of this coin were also used, and pieces of the value of 5, 4, 3, 2, 1½ oboli, and ½, ⅓, ¼th of an obolus respectively are to be found in collections.



Brass Obolus of Metapontum. Actual diameter of coin, 1½ inches

O'Brien, William Smith, Irish Nationalist, born 1803, died 1864. Entering Parliament in 1826, he joined the Young Ireland group of politicians, and advocated the use of physical force. In an endeavour (1848) to effect a rising in Tipperary, he was surrounded in a cabbage-garden, arrested, tried by special commission at Clonmel, and sentenced to death, but in the end this was commuted to transportation. He was set at liberty in 1854, and fully pardoned in 1856.

Obscene Books and Pictures. To exhibit or offer in any public place any obscene picture or written or printed matter is an offence under the Indecent Advertisement Act, 1889, and is punishable by a fine not exceeding £2 or imprisonment not exceeding one month; while by the Post Office Act, 1908, anyone sending by post a package on the outside of which are any obscene words or designs is liable to a maximum penalty of £10 or imprisonment for twelve months.

Obscur'antists, a word originally used at the time of the Revival of Learning, and applied to the opponents of progress and enlightenment. The term is derived from Ulrich von Hutten's famous satire, entitled *Epistolæ obscurorum virorum*, directed against the monks of Cologne.

Observatory, an institution or building supplied with the necessary scientific instruments and devoted to the observation of natural phenomena, astronomic, magnetic, or meteorological. The astronomical observatory is the one of most general interest. Astronomical observation began at an early date in China; the pyramids in Egypt seem in some way to have been associated with stellar observation; and the first historical observatory was founded in Alexandria 300 B.C. Its work was begun by Aristillus, and continued by Timocharis, Hipparchus, Aristarchus, and others. The first European observatory was built at Nürnberg by Bernhard Walther in 1472, and this was followed in the sixteenth century by Tycho Brahe's famous observatory on the Island of Hveen, near Copenhagen, while another was erected by the Landgrave of Hesse at Cassel in 1561. Through the labours of Tycho practical astronomy became associated with the universities, so that Leyden and Copenhagen founded observatories. These were followed by the construction of the Royal Observatory at Paris (1667); the Greenwich Royal Observatory (1675); the Tusculan Observatory, near Copenhagen (1704); Berlin (1705; new observatory 1835); Vienna (1756); Dublin (1785); Königsberg (1813); Sydney (1820); Cape of Good Hope (1820); Edinburgh (1825); Pulkova, near Petrograd (1839); Cambridge, United States (1839); Washington, United States (1845); Melbourne (1853); Lick Observatory, California (1888); Lowell Observatory, Arizona (1894); Yerkes Observatory, Wisconsin (1896); Mount Wilson Observatory, California (1905). The director of the Royal Observatory at Greenwich is the Astronomer Royal, and the director of that at Edinburgh is the Astronomer Royal for Scotland. The chief observatory instruments are the telescope, equatorial, transit circle, and transit instrument, together with the sidereal and the solar clock. In the larger observatories the application of spectrum analysis, photography, photometry, &c., has greatly increased the number and variety of observations. The observatory building must be constructed in a very stable manner, and as the instruments must be out of contact with the walls and flooring, they are supported on stone pillars having foundations separate from the rest of the building.

Obsid'ian, vitreous lava, or volcanic glass, lava which has become glassy by rapid cooling. The chemical composition of the rhyolites and trachytes allows most readily of the formation of obsidian in association with their flows. In Hungary and the Yellowstone Park thick masses of this volcanic glass occur. Obsidian was anciently used both for implements and for religious purposes. The early Cretans found it on the Island of Melos, and imported and used it at the very dawn of their history. Obsidian was carried into Egypt, Troy, Cyprus, Greece, and Malta. The Jews used obsidian as well as flint in religious ceremonies. Obsidian implements have been found in Neolithic strata near Nineveh. In ancient Egypt, during the Pyramid age, the copper statues of Pharaoh Pepi I and of his son were given eyes of obsidian. As shells were used for mummy eyes, it would appear that obsidian was likewise regarded by the Egyptians as a 'life-giving' substance. Obsidian was an important article in the trade of ancient times. There are extensive obsidian-mines at Hidalgo, in Mexico, and the Aztecs and the Maya peoples of Central America made their sharpest weapons and their most serviceable implements of obsidian, their copper not being hardened sufficiently to be kept sharp when edged. The Aztec god Tezcatlipoca had an obsidian mirror which appears to have served a double purpose as a religious object. It revealed 'the will of the gods', and was used, as was a crystal by the Greeks and Romans, for lighting sacred fires. The Orphic poem on precious stones (verses 177 *et seq.*) describes the Greek method. Crystals were used for lighting sacred fires by the Siamese and the Chinese. In Peru obsidian mirrors, which were polished and had concave surfaces, were used, as were crystals elsewhere, to kindle holy fires, being held so as to concentrate the rays of the sun. In Peru, as in Rome, the sacred fire was guarded by vestal virgins. The Peruvian virgins were brides of the sun, as the Roman virgins were brides of the fire. In Peru mirrors were used by women, and it was 'a disgrace if not ignominy' to men to look in mirrors. Evidently obsidian was in the New World closely associated with women, fire, and the sun when used for religious purposes. The god Tezcatlipoca, who was especially connected with obsidian, resembles in certain of his aspects the black god Krishna of India. His statue in Mexico was of black obsidian. Black stones were kept by the Maya peoples in their temples to reveal 'the will of the gods', and these may have been of obsidian. There are references in the Chinese texts to mirrors and screens of jade and stone which had a religious value. In Peru the tombs of the Incas have yielded mirrors of burnished silver and of obsidian, as well as vases and ornaments of gold and silver. It would appear that obsidian, like pearl-shell, crystals, jade, gold, and silver, acquired at an early period, and retained for many centuries, a religious value, and that it was connected with the sun, the 'eye' of heaven, and therefore with fire and the 'vital spark'.

Obstetrics, or **Midwifery**, is the branch of the practice of medicine concerned with the welfare of women during childbirth; but it also includes within its scope the ailments to which a mother is subject during the periods of gestation and lactation, and is also closely related to gynæcology or the treatment of the diseases peculiar to women, many of which are the result directly or indirectly of child-bearing.

Among primitive peoples it is not uncommon for a woman to give birth to a child without help from attendants of any sort; but it is perhaps more usual for a woman to attend her and to care for the child when born. Such an attendant may be merely a relative or friend, or a woman who practises as a midwife. Even in this country at the present time a considerable number of women are attended in child-birth merely by midwives; and two centuries ago it was the exception rather than the rule for a lying-in woman to be attended by an obstetric surgeon or man-midwife, as he was then called. Thus when he was called in by George III to attend his young queen's confinement, Dr. William Hunter merely waited in an ante-room in case the midwife needed his assistance. In the middle of the eighteenth century the art of midwifery was passing through a severe struggle. For the practice was almost exclusively in the hands of the midwives, and even when men practitioners devoted themselves to obstetric practice it was merely as advisors to the midwives, who tried to preserve the art as a monopoly for their sex and only called in men's help when they got into difficulties—a phase of history that is now being repeated when qualified medical practitioners of the female sex attempt to make the same claims as the midwives made two centuries ago. The establishment of the position of the man-midwife in London and England was largely the work of two Lanarkshire practitioners, Dr. William Smellie and Dr. William Hunter. Smellie came to London in 1739 and bore the brunt of the fierce conflict for supremacy with Mrs. Nihell, the champion of the midwives; but his predecessor Sir R. Manningham had already founded the first maternity institution. William Hunter turned his attention chiefly to midwifery, and his knowledge of anatomy, his professional skill and polished manners, contributed very materially to the establishment of obstetric surgery and the rôle of the male practitioner, as well as to the development of the science and art of obstetrics. Hunter was appointed man-midwife to the Middlesex Hospital in 1748, and Surgeon Accoucheur to the British Lying-In Hospital next year. When Smellie came to London the art of midwifery was in its infancy, and he was mainly responsible for the introduction of the use of forceps to assist the extraction of the child in cases of difficult labour. The obstetric forceps had been recently invented by the Chamberlens in France, but it was a most dangerous if not positively destructive instrument; and Smellie set himself the task of finding better methods which in cases of difficult labour would subject the child's life to less risk. He laid down the rules for the safe application of the forceps, and rendered an incalculable service to medical practice and mankind. But the opposition of Hunter, who regarded the instrument as a dangerous invention, brought it into disfavour towards the end of the eighteenth century, until the French surgeon Baudelocque restored it to its rightful place as an indispensable aid in the obstetric surgeon's work. Although William Hunter delayed reform in this matter, in other ways he was responsible for the introduction of wiser methods into midwifery. In particular he taught obstetric surgeons and midwives to leave it to nature to get rid of the after-birth and not to attempt to remove it forcibly unless there were very definite reasons for adopting such a procedure.

The birth of a child is a natural act which in the majority of cases takes place without any artificial assistance; and it is a wise rule in the case of normal and healthy women to interfere with the physiological process of parturition as little as possible. But it not infrequently happens, especially under the conditions incidental to life in large industrial centres, that the mother's pelvis may be contracted or distorted or her muscular powers inadequate for the expulsion of the child. In the latter case the use of an instrument, the forceps, to assist the extraction of the child from the mother's womb may be necessary. In the former case the disproportion between the size of the baby's head and the outlet from the mother's body may be so great that it is impossible for the child to be born in the normal way, even with the help of forceps. In such cases the surgeon may be compelled to open the abdominal cavity and, after cutting into the womb, remove the infant through the front of the mother's body. This operation is known as Cæsarian Section, because of the tradition that Julius Cæsar was brought into the world in this way. In other cases difficulties arise from the fact that the infant may occupy some unusual position in the mother's womb. Normally the head is placed below and is born first; as the head of the new born child has a bigger diameter than its body, if the head dilates the passage of exit the birth of the child's body and limbs is a simple matter. But if some other part of the body tends to emerge first, difficulty and delay are likely to result. To prevent this the obstetric surgeon often resorts to the operation of *turning*, that is, altering the position of the child in the womb so that it will be more favourably placed for parturition. Before the birth of the child the membranous sac (or caul), in which the child is contained within the womb, bursts and allows the water (amniotic fluid) to escape; then the child is born, and later on the after-birth (or placenta), by which the navel string (umbilical cord) is attached to the lining of the womb, comes away and so completes the last stage of labour. Some of the most awkward complications of labour are due to a malposition of the placenta; others result from a faulty or incomplete removal of the after-birth.

One of the great triumphs of preventive medicine is the discovery that by means of thorough cleanliness and adoption of aseptic methods such ailments as puerperal fever and 'white leg' can be prevented. In former times these results of infection were responsible for a vast number of deaths in child-birth or of serious disability in those whose lives were spared. The training of midwives in aseptic methods has been the means of reducing the risks of child-bearing very materially, and of sparing the lives of vast numbers of mothers and children.

In addition to being an art that aims at assisting women in child-birth, minimizing the risks both to mother and child, and preventing unnecessary suffering, midwifery can also be regarded as the branch of medical science concerned with the study of all the conditions to which a woman and her offspring are exposed as the result of pregnancy and during the period of lactation. Many of the gynæcological ailments, such as misplacements of the womb, the development of cysts of the ovary or tumours of the womb, or interference with the tubes that carry the ova to the womb, directly affect the diagnosis and treatment of the conditions found among pregnant women. In some cases the fœtus which has developed from a fertilized ovum may be prevented from reaching the womb, being retained within the tube or oviduct or even in the ovary itself. These cases are described as extra-uterine pregnancies (tubal or ovarian respectively), and call for surgical interference to prevent more serious consequences. Thus the growth of the fœtus will eventually lead to a rupture of the tube or ovary, with serious hæmorrhage, and the escape of the fœtus itself into the mother's body cavity, from which it has to be removed by surgical operation.

Within recent years there has been considerable legislation dealing with obstetrics, and during the past twenty years four important Acts relating to the subject have been passed. (1) The Midwives Act (1902, amended 1918) deals with the training of midwives and lays down certain regulations in regard to their practice. (2) Notification of Births Act (1907) requires that every birth (live or dead) be notified to the Medical Officer of Health of the district in which it has occurred. (3) The Maternity Benefits of National Insurance Act (modified 1918) provides a sum of money for the insured woman, or wife of an insured person at the time of confinement. (4) The Maternity and Child Welfare Act (1918) gives power to local authorities to make arrangements for the provision of ante-natal clinics for mothers, and home visiting of mothers; to ensure that the mother has skilled attendance during her confinement, and hospital accommodation in abnormal cases; also for the establishment of post-natal clinics for systematic advice and treatment of infants, with hospital accommodation when serious complications arise.

Ocari′na, a musical wind-instrument of clay, of torpedo shape, pierced with a number of small holes, and giving a sweet tone.

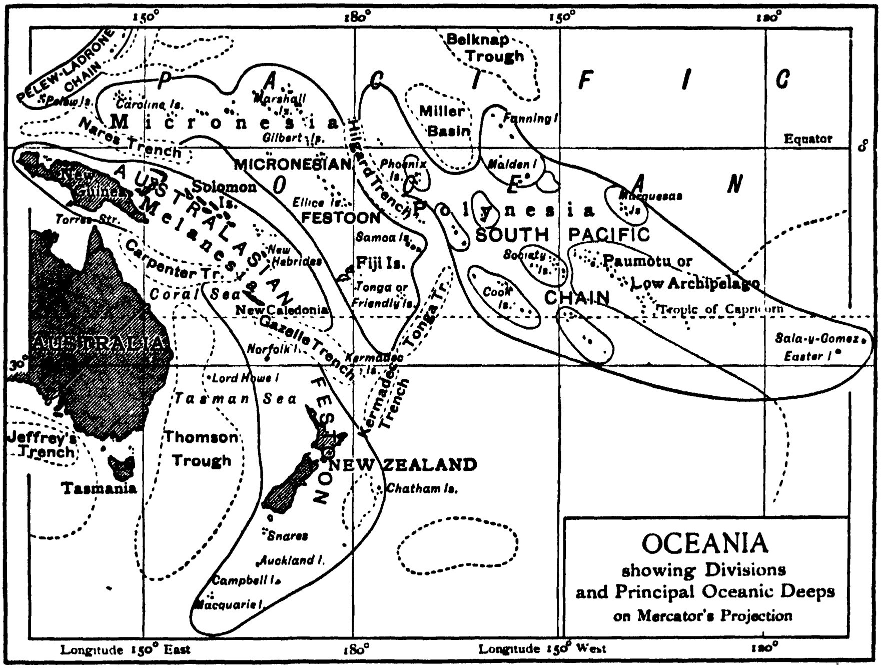
Occam, or Ockham, William of, mediæval monk and scholar, known as *Venerabilis Inceptor* and *Doctor Invincibilis*, born about the end of the thirteenth century, probably at Ockham, in Surrey, died at Munich in 1349. Educated at Oxford and at the University of Paris, he became a Franciscan, and his attitude on the question of evangelical poverty led to a controversy with Pope John XXII. Seized and imprisoned at Avignon, he escaped in 1328, and was cordially received by Louis the Bavarian in Italy. He was excommunicated, and spent the rest of his life at Louis's court, engaged in constant polemical warfare against the Papal authority. In 1342 he became general of the Franciscans. Occam is regarded as the second founder of nominalism (q.v.), for which he secured a final victory over realism, and he was a forerunner of the Reformation. Several Latin works by him are extant.

Occasionalism, or the doctrine of occasional causes, the theory evolved by the Cartesians, which maintains that mind and matter act upon each other not directly but upon the occasion of certain changes in the one or the other. It explains the reciprocal action upon each other of the soul and the body. As the soul and body, according to Descartes, are two entities with entirely different properties, the essence of the former being thought and that of the latter extension, a difficulty naturally arose as to how the one can act upon the other.

Descartes, therefore, assumed that the intercommunication between soul and body was the result of divine interference. The suggestion was taken up by several of his disciples, who taught that on the *occasion* of the determinations of the mind God himself excites in the body the sensations corresponding to them, and on the *occasion* of the motions of the body He excites in the mind the sensations and passions which correspond to them. The doctrine was subsequently developed by Geulincx (1624–69), who may be considered as the real founder of occasionalism, and Malebranche (1638–1715). Occasionalism has much in common with Leibnitz's doctrine of *pre-established harmony*, from which, however, it must be distinguished.

Occlusion, in chemistry, the absorption of a gas by a metal, as of hydrogen by palladium. Thus in the process of decomposing water, a strip of palladium, if used as the negative electrode, will absorb or 'occlude' from 800 to 900 times its volume of hydrogen, swelling during the process. Other examples of occlusion are the absorption of hydrogen by red-hot platinum, of carbonic oxide by red-hot cast-iron, and of oxygen by melted silver. Palladium, even when cold or slightly warm, will take up a very considerable quantity of hydrogen.

Occultation is the term used in astronomy for the hiding of a star or planet from our sight through the interposition of another nearer celestial body, and specifically applied to the concealing of a star or planet by the moon.



OCEANIA
showing Divisions
and Principal Oceanic Deeps
on Mercator's Projection

Ocea'nia, the collective term for the islands of the Pacific Ocean, but particularly applied only to those in the South Sea. These islands may be divided into lines or festoons as indicated in the map, the course of the lines being dependent on the geological structure of the adjacent continents. The principal groups are the Australasian Festoon, the Micronesian Festoon, and the South Pacific Chain (including Polynesia, q.v.).

Australasian Festoon.—This consists of a line of islands east of Australia, formed of continental rocks. The festoon begins on the south with the archipelago of New Zealand, and continues northward through Norfolk Island, New Caledonia, New Hebrides, the Solomons, and ends in New Guinea. *Melanesia.*—The northern islands are peopled by Melanesians, a branch of the negro race, having the woolly hair, short heads, dark skins, thick lips, and broad noses of the negro. The islands from New Guinea to New Caledonia form Melanesia, and they rest upon the submarine Melanesian plateau. These islands are related to Australia both geologically and by the characteristics of their flora and fauna, and are the remains of a formerly continuous land connecting New Zealand with both New Guinea and Australia.

Micronesian Festoon.—This festoon is roughly concentric with the Australasian Festoon, and includes the islands known as Micronesia and some of the islands included in Polynesia. It begins to the east of the Philippines, with the Caroline and Marshall Islands, and extends south-eastwards through the Gilbert and Ellice groups to the Fiji and Tonga Islands. These groups all occur on the edge of a submerged plateau which extends south-westward to Australia, and they would appear to have been connected with that continent.

South Pacific Chain.—The chain comprises a long line of islands branching from the Micronesian Festoon at the Samoan group and extending eastward across the Southern Pacific. Its islands may be the last survivors of a land which once connected South America and Australasia, and enabled the marsupials and land-tortoises found in both regions to migrate from one to the other. The South Pacific Chain includes the Low Archipelago or Paumotus, the Society Islands, the Cook Islands and the Marquesas Islands, Easter Island, and Sala-y-Gomez. Separate articles will be found on the most important island groups.

Oceanography is the branch of geography which deals with the seas and oceans. The province of the oceanographer is the investigation of the physical properties of sea water, the distribution of temperature and salinity, the movements of sea water, the deposits on the floor of the ocean, the origin of ocean basins, and the physical conditions of marine life. The science has considerable practical importance in relation to marine food fisheries, problems of navigation, questions of coastal erosion, and the laying and maintenance of deep-sea cables. As a science it is closely related to physics, chemistry, and geology. Its foundations were laid by the voyage of H.M.S. *Challenger* (1872–6). For a sketch of its history see *Deep-sea Exploration.* Oceans and seas cover 70·8 per cent of the surface of the globe. The distribution is most irregular: in the northern hemisphere 60·7 per cent of the surface is water, and in the southern hemisphere 80·9 per cent. The globe can be divided into hemispheres of which one has 52·7 per cent of water surface, and the other 90·5 per cent. There are actually only three great oceans, Atlantic, Pacific, and Indian, all of which are connected by the so-called Southern or Antarctic Ocean. For the sake of convenience the term Southern Ocean is generally applied to the waters south of a line joining the southern extremities of Africa, Tasmania, New Zealand, and South America. The Arctic Ocean is really an enclosed sea of too small an extent to merit the name of ocean. Seas are of two forms: those narrowly connected with the ocean, such as the Mediterranean Sea, Baltic Sea, Red Sea, or Arctic Ocean; and those with wide connection with the ocean, such as the North Sea, Barent's Sea, or Weddell Sea. Enclosed seas show great differences in temperature, salinity, and circulation compared with oceans in the same latitudes. The floor of the oceans consists essentially of three areas: the continental shelf between the shore and the 100-fathom line; the steep continental slope between 100 and about 1700 fathoms; and the abyssal area, a more or less undulating plain below 1700 fathoms on an average. From the abyssal area there rose not infrequently volcanic cones that often appear above the ocean waters as lofty, isolated islands. The weight of evidence tends to support the view that the great ocean basins are permanent features of the surface of the globe, but the problem is far from settled. One of the great obstacles in the way of its solution is the lack of information regarding the solid rocks, below the accumulated deposits on the ocean floor. On the other hand, there is no doubt that the form and depth of many seas have materially changed even in recent geological times. See *Deep-sea Exploration*; *Hydrography*; *Geography.*

Oce'anus, in classical mythology, the eldest of the Titans, regarded as the god of the ocean or the river surrounding the earth. Oceanus and Tethys were regarded as the parents of rivers, and of the Oceanides or ocean nymphs. The Greeks considered the earth as a flat circle surrounded by a river (Oceanus), and the term ocean was thus applied especially to the Atlantic, in contradistinction to the Mediterranean Sea.

Ocel'lus, one of the minute simple eyes of insects, many echinoderms, spiders, myriapods, crustaceans, molluscs, annelids, &c. In insects these ocelli or stemmata are usually situated on the crown of the head between the great compound eyes, whose simple elements they resemble in structure, and in rare cases may be the sole organs of vision. They are probably used for distant vision, and the compound eyes for near vision.

O'celot (*Felis pardalis*), a well-known carnivorous mammal of the cat kind ranging from Arkansas to Paraguay. It attains a length of about 3 feet, while the tail measures some 18 inches more. The ocelot inhabits great forests; its food consists mainly of birds and rodents; and it is timid but bloodthirsty.

Ocelot (*Felis pardalis*)

Ochil Hills (ō'*hil*), a hill range of Scotland, on the borders of Perth, Clackmannan, Kinross, and Fifeshire; length, about 25 miles; average breadth, about 12 miles; highest summit, Ben Cleuch, 2363 feet.

Ochre, the name given to naturally occurring hydrated oxide of iron. It is found in the form of an earth mixed with silica and alumina, and varies in colour from light yellow to reddish brown. It is employed as a pigment in the manufacture of paints, and also for colouring paper, linoleum, and other substances. It is prepared for use by grinding and washing to remove sand, &c. Incrustations of the oxides of other metals such as nickel, antimony, and bismuth are also termed ochres, but are of less importance.

O'Connell, Daniel, Irish agitator, born in Kerry in 1775, died at Genoa in 1847. He was educated at a school in Cork and the Catholic colleges of St. Omer and Douai, studied for the Irish Bar, and soon became distinguished for legal skill and oratory. Turning his energy to Irish politics, he advocated Catholic Emancipation; skilfully kept the agitation within constitutional lines; became member for Clare in 1828; and attained his triumph in the following year when the Government of the Duke of Wellington granted the Catholic claims. After the Reform Bill he became conspicuous as the head of a parliamentary body called 'O'Connell's Tail'. In 1841 he called together enormous meetings throughout Ireland, and loudly raised a cry for the Repeal of the Union. The Government determined to put down the agitation, and O'Connell was arrested, convicted, and sentenced to twelve months' imprisonment with a fine of £2000. In a few months the House of Lords quashed this judgment. Meanwhile, however, a new and more advanced party had sprung up in the Repeal Association, and the health of O'Connell was broken down. He made his last speech in Parliament in April, 1847.

Oc'tant, in astronomy, that position or aspect of a heavenly body, as a planet or satellite, when half-way between conjunction or opposition and quadrature, or distant from another point or body the eighth part of a circle or 45°. The word is also applied to an older form of instrument for measuring angles, on the same principle as the sextant, but having an arc of only 45°. Owing to the doubling of the angle by reflection, it measured angles up to 90°, and was commonly called a quadrant.

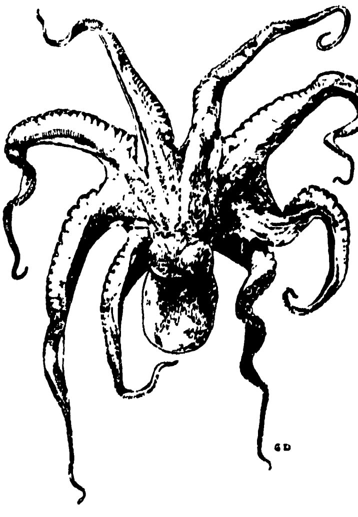
Octave, in music, an interval of eight notes, as from C to C^1, or B_1 to B (see *Acoustics*). When two notes an octave apart are sounded together, their mental effect is almost the same as that of a consonance. The physical explanation is simple. Whatever the frequency, i.e. number of vibrations per second, of a note may be, the frequency of its octave is just double. But if we represent the frequency of a note by 1, the frequencies of its harmonics (q.v.) will be 2, 3, 4, &c.; and the note an octave higher with its harmonics will have frequencies 2, 4, 6, 8, &c. Thus, as Helmholtz puts it, when a higher voice executes the same melody an octave higher, we hear again a part of what we heard before, and at the same time we hear nothing that we had not previously heard.

Octa'via, daughter of Gaius Octavius and of Atia, and sister to the Emperor Augustus, illustrious for her virtues, her beauty, and her accomplishments. She was the widow of Claudius Marcellus, by whom she had a son and two daughters, when she was married, at the instance of her brother, to the triumvir Mark Antony. The latter neglected her for Cleopatra, Queen of Egypt, an insult which Octavianus greatly resented, and which helped to bring about the war between himself and Antony. Octavia died in 11 B.C.

Octa'vo, the size of one leaf of a sheet of paper folded so as to make eight leaves: usually written *8vo*; hence, a book having eight leaves to the sheet. There are different sizes of octavo, arising from the different sizes of paper employed; as, *foolscap 8vo*, *demy 8vo*, *imperial 8vo*.

October (from the Lat. *octo*, eight), originally the eighth month in the Roman calendar, whence its name, which it still retained after the beginning of the year had been changed from March to January.

Oc'topus, a genus of dibranchiate Cephalopoda, familiarly known as poulpes. They have eight arms, each with two rows of suckers, which are sessile or unstalked. The prominent head is joined to the body by a distinct neck, and the body itself is short, generally more or



Octopus

less rounded in shape, and unprovided with side or lateral fins. They have attained a notoriety from tales circulated concerning their ferocity and the existence of gigantic members of the genus, though the largest cephalopods that have been met with have belonged to other genera. The *O. vulgāris*, or common poulpe, is found on the British shores, but is more common in the Mediterranean. It is said to reach a length of 9 feet and a weight of 68 lb., the arms being long and slender. A related form (*Eledone moschata*), which possesses but one row of suckers on each arm, is eaten by natives of the Mediterranean littoral.

Octroi (ok-trwȧ), an old French term signifying a grant, privilege, or monopoly from Government to a person or to a company. Octroi also signifies a tax levied at the gates of French cities, towns, &c., on produce brought in for use. Abolished in 1791, it was again introduced in 1799.

Ocu'ba-wax, a vegetable wax obtained from the fruit of *Myristica ocūba, officinālis*, or *sebifĕra*, a plant of the nutmeg genus growing abundantly in the marshy grounds on the shores of the Amazon and its tributaries. It is easily bleached, and is used extensively in Brazil for the manufacture of candles.

Odal Right, an ancient system of land tenure, similar to allodial tenure, which prevailed in Northern Europe before the introduction of the feudal system. Odal or udal tenure still prevails in Orkney and Shetland.

Oddfellows, Independent Order of, a large and extensively ramified friendly society, having its head-quarters in Manchester. It was originally an association of a convivial kind, modelled on freemasonry, and still retains passwords and secret signs. It assumed its present form at a convention in Manchester (1813), and has spread widely in Britain and elsewhere. The organization was introduced into the United States in 1819, and severed its connection with the British Union in 1842. Branch societies exist in most countries. See *Friendly Societies*.

Ode (Gr. *ōdē*, song) originally a poem intended to be sung; a lyric poem written in an elaborate form, and usually dignified in subject and style. There were two kinds of ode in ancient Greece, one the personal utterance of the poet, the other the choric song of the poet's trained band of dancers. Both kinds of composition have been imitated in modern times, so that the word 'ode' is loosely applied to any elaborate lyric poem. The personal ode reached perfection in the hands of Alcæus, Anacreon, and Sappho; in Roman times Catullus imitated Sappho with complete success, and Horace took Alcæus and Anacreon for his models. These two great Latin poets gave the personal ode or lyric a popularity which it would not otherwise have enjoyed. The choral ode developed upon different lines, and eventually became the ode proper. Alcman first gave it a strophic arrangement, which became one of its essential features. Stesichorus, Ibycus, and the greater Simonides developed it until it culminated in the work of Bacchylides and Pindar.

In modern times the ode was revived by Ronsard and the members of the Pléiade. Its popularity in France was not long-lived. In England Spenser wrote two fine odes, his *Epithalamium* and *Prothalamium*. Ben Jonson and some of his 'sons' wrote elaborate poems which they called odes; and Milton wrote several lofty odes. Abraham Cowley, however, was the first to elaborate the 'Pindaric Ode' in English, his idea of Pindar was that he wrote a kind of *vers libre*, a theory which made the Greek model an easy one for those poets who found their genius cramped by the exigencies of rhyme and rhythm. It is only comparatively recently that it has been recognized that Pindar's verse obeys the most exacting laws. Dryden and Congreve may be mentioned as writers of odes. The latter wrote a *Discourse on the Pindarique Ode* (1705). Gray's odes approach more nearly to the Pindaric model; those of Collins are of the lyric kind. Wordsworth, Coleridge, Tennyson, Shelley, Keats, Swinburne, and Victor Hugo have all written odes, some entirely irregular, some merely elaborate lyrics, and some conforming more closely to the Greek type.—Cf. E. Gosse, *English Odes*.

Odense, a seaport-city, the third largest of Denmark, capital of the Island of Fünen, on the River Odense, and served by ship-canal to Odense Fjord. The cathedral of St. Knud (founded 1086) and the church of Our Lady (twelfth century) are interesting. There are manufactures of cloth, tobacco, and chemicals, and exports of dairy-produce and hides. Hans Andersen was born at Odense, and his house is now a museum. Pop. (1916), 45,300.

Odenwald (ō'den-vȧlt), an afforested mountain area (Katzenbuckel, 2057 feet) of Hesse-Darmstadt, Germany, between the Neckar and the Main. It is about 50 miles in length, presents charming scenery, and is rich in legend.

Oder (Lat. *Viadus*), a river of Germany, which rises in the Moravian tableland, Czecho-Slovakia. It flows through Moravia, Silesia, and Brandenburg, widens into the Stettiner Haff, and enters the Baltic by three channels; length, 550 miles. The traffic on this river and connected canals is important. It has been canalized between Ratibor and Swinemünde (480 miles). On its banks are Breslau, Glogau, Frankfort, Küstrin, Stettin, and Kosel.

Odes'sa (Rom. *Istrianorum portus*), a seaport-city of South Russia, in the government of Kherson and on the Black Sea. It is the southern metropolis, and is the terminus of the southern railways. There is a university (founded 1865), a cathedral, and an observatory. Odessa was founded by Catherine II by a rescript (24th May, 1794), and the duc de Richelieu, a French *émigré* noble, was the first Governor (1803–14). The town was bombarded by an Anglo-French squadron in 1854, and in 1876 it was blockaded by the Turks. During the Revolution and anti-Semitic controversy of 1905 Odessa was terrorized by the mutineers of the Black Sea fleet, Jews were massacred, and the city was steeped in blood. During the European War it was bombarded by the Turkish fleet, occupied by German land forces (12th March, 1918), and retaken by the Bolsheviki during 1920. Pop. nominally about 620,000.

Odin, the chief god of Scandinavian mythology, the omniscient ruler of heaven and earth, having his seat in Valaskjalf, where he receives through his two ravens, *Hugin* and *Munin*, tidings of all that takes place in the world. As war-god he holds his court in Valhalla, where all brave warriors arrive after death and enjoy the tumultuous pleasures they delighted in while on earth. His wife is Frigga. The fourth day of the week, Wednesday, derived its name from this deity. See *Northern Mythology*.

Odoa'cer, or **Odovacar**, ruler of Italy after the fall of the Western Empire, A.D. 476 to 493. He was of German origin, the son of Edico or Idico, hereditary head of the Scyrri tribe, and received his early training in the camp of Attila, King of the Huns. He joined the imperial guard of the Roman army, was chosen head of the barbarian confederates, and having overthrown Romulus Augustulus, the last of the Roman emperors, he assumed the title of king in 476. Out of policy he paid court to the Byzantine Emperor Zeno, from whom he received the title of *Patricius* or Patrician. In 489 Italy was invaded by the Ostrogoths under Theodoric, and Odoacer was defeated in a series of battles. Besieged in Ravenna, he capitulated, and was at first well treated by Theodoric, who shared the kingdom with him. In March, 493, however, Odoacer was treacherously killed by the Gothic king.

Odontoglos'sum, an extensive genus of orchids, natives of Central America, much prized by cultivators for their magnificent flowers, which are remarkable both for their size and the beauty of their colours. A considerable number of species have been introduced into Europe, and grow well in a moderate temperature. *O. crispum* or *O. Alexandræ* is a superb flower, and is named after the Queen-mother.

Odon'tophore, the so-called ' tongue ', or ' palate ', or masticatory apparatus found in the mouth of all molluscs but bivalves—which are thus collectively known as the Odontophora. This structure consists of a muscular projection on the floor of the mouth, strengthened by cartilages, and supporting a ribbon or strap-like band (radula) provided with flinty or siliceous teeth variously disposed in a transverse manner. This ribbon is moved from front to back with a scraping action, and grows continuously as it gets worn away, like a finger-nail from its bed.

Odontopteryx, an Eocene fossil bird from the London Clay of the Isle of Sheppey. It was probably a web-footed fish-eating bird, most nearly allied to the ducks and geese. It had a bill with saw-like bony projections resembling teeth.

Odontorni'thes, a name for certain fossil birds characterized by having teeth, as Hesperornis and Ichthyornis (q.v.).

Œcumen'ical (Gr. *oikoumenikos*, pertaining to the whole inhabited world), universal, an epithet applied to the general councils of the Church. From the time of the Council of Chalcedon (A.D. 451) the patriarchs of Constantinople took the title of œcumenical, in the same sense as the epithet Catholic is used in the Western Church. See *Council*.

Œdema is the effusion of fluid into the subcutaneous tissues of the body. It may be either general or local. The most common forms of general œdema are cardiac œdema, due to weakness of the heart's action, and seen first in the most dependent parts remote from the heart; renal œdema, due to disease of the kidneys and usually seen under the eyes, in the lower part of the back, in the genitals, and in the legs; hepatic œdema, due to disease of the liver, and seen in the legs with accumulation of fluid in

Odontoglossum luteo-purpureum

the abdominal cavity. Slight œdema often occurs in anæmia, and may be considerable in pernicious anæmia. Œdema may arise in the wasting diseases of infants and children, and is often present in the later stages of tuberculosis and cancer. Local œdema is seen in wounds and infected areas along with other signs of inflammation, and it occurs when there is obstruction to the flow of blood in the veins of any part.

Œ'dipus, in ancient Greek legend, son of the Theban King Laius and his queen Jocasta. He was exposed as an infant—on account of an oracle saying that Laius would be killed by his son—and was brought up at the court of Corinth. He left his foster-parents, however, the Delphic oracle having advised him to avoid the soil of his country. In a narrow road in Phocis he met King Laius and unknowingly killed him. Having solved the riddle of the Sphinx, he became King of Thebes, and married his mother Jocasta—a fate foretold by the Delphic oracle. On realizing what had been done Jocasta hanged herself, and Œdipus put out his own eyes. The *Œdipus* of Æschylus and that of Euripides are lost, but the *Œdipus Tyrannus* and *Œdipus Coloneus* of Sophocles remain. The story has also been made the subject of tragedies by Corneille, Voltaire, Chénier, Dryden, and Lee.

Œdogonium, a genus of freshwater Green Algæ, group Ulotrichales. The species are small unbranched filamentous plants, growing attached mostly to larger aquatics. They are oögamous. The zoöspores and male gametes are peculiar in having numerous flagella arranged in a circle around the anterior end of the cell.

Oehlenschläger (*eu*'lĕn-shlā-gĕr), Adam Gottlob, Danish poet and dramatist, born at Vesterbro, Copenhagen, 1779, died 1850. After an irregular education he tried the stage, but failed in the profession of actor. He then studied law, but after 1802 devoted himself to literature, and in 1808 published his first volume of poems. Recognized as the chief Danish poet, he received a Government grant which enabled him to visit Germany, France, Switzerland, and Italy (where he met Goethe, Fichte, and Madame de Staël). His finest works, such as *Baldur hin Gode*, *Palnatoke*, *Axel og Valborg*, and the tragedy of *Hakon Jarl*, were written at this period. Returning to Denmark in 1810, he was appointed professor of æsthetics in the University of Copenhagen. His chief works, besides those above-mentioned, are: *Helge*, *Hroars Saga*, *Nordens Guder*, *Erik og Abel*, *Dronning Margrethe*, and *Dina*.

Oelsnitz (eulz'nits), a town of Germany, in Saxony, on the White Elster, with manufactures of cottons, yarn, and wool, and industries in brewing and pearl-fishing. Pop. 14,000.

Oersted, or **Örsted** (eur'sted), Hans Christian, Danish physicist, born in 1777, died at Copenhagen 1851. He studied at the University of Copenhagen; spent several years at the expense of Government in Holland, Germany, and Paris; was in 1806 appointed extraordinary professor of physics at Copenhagen; and in 1812–3, while on a second tour in Germany, he drew up his views of the chemical laws of nature, which he afterwards published in Paris under the title of *Recherches sur l'identité des forces électriques et chimiques*. His fame rests on his discovery (in 1819) of the fundamental principles of electro-magnetism.

Oesel (Esthonian *Saaremaa*), an island of Esthonia, at the entrance to the Gulf of Riga, formerly in the government of Livonia, Russia. The coast-line is bold, but the surface is generally low and level. Stock-raising, agriculture (flax, hemp, and corn), and fishing are the staple industries. Arensburg (Esthonian *Kuresaare*) is the chief town. The people are Esthonians, and the island forms one of nine districts of Esthonia. Area, about 1000 sq. miles; pop. 45,000.

Œsoph'agus, or **Gullet**, the muscular tube which leads from the pharynx or back part of the mouth to the stomach. In man the length of the gullet is from 9 to 10 inches. It begins at the fifth cervical or neck vertebra, at a point corresponding with the cricoid cartilage of the larynx, and it runs in a slightly deviating course downwards to the stomach. Thus in the neck it lies close behind the windpipe; whilst in the chest it bends to the right side and then to the left before it pierces the midriff or diaphragm—which forms the floor of the chest—by a special aperture existing in that structure. Internally the gullet is lined with mucous membrane, and between the mucous and muscular layers cellular tissue exists. The mucous or lining membrane is thick and of pale colour, and is arranged in longitudinal furrows or folds. In the lower animals the modifications of the œsophagus are various. In birds, for instance, it presents the expansion known as the *crop*.

Offa, a king of Mercia, who attained the throne after Ethelbald, on defeating the usurper Beornred, A.D. 757. He brought Kent under his sway, and reduced the power of Wessex by a defeat inflicted in 777. He also defeated the Welsh, took from them part of their border lands, and to keep them within their new limits erected here the rampart known as Offa's Dyke. He founded the Abbey of St. Albans, was a liberal patron to the Church, and promoted trade between England and the Continent. He died in 796.

Offa's Dyke, a rampart, the remains of which may still be seen extending along the English and Welsh border from the vicinity of

Newmarket, in Flintshire, to Beachley, at the mouth of the Wye; length, about 100 miles. Its erection is ascribed to King Offa of Mercia.

Offenbach, Jacques, French composer, born of Jewish parents at Cologne 1819, died 1880. He entered the Paris Conservatoire in 1835; became proficient on the violoncello, and for some time played on this instrument in the orchestra of the Théâtre Comique. In 1847 he became conductor at the Théâtre Français, and subsequently opened the 'Bouffes Parisiens', where he enjoyed immense popularity as the composer of such operas as *Orphée aux Enfers*, *La Grande Duchesse*, *La Belle Hélène*, *Madame Favart*, *La Barbe Bleue*, *Geneviève de Brabant*, and *La Princesse de Trébizonde*. His last opera, *Les Contes d'Hoffmann*, was produced at the Opéra Comique in the February following his death.

Offenbach (of'en-bâh), a town of Germany, in Hesse, on the Main, and on the electric railway to Frankfort. It has an old castle, and is an important commercial and manufacturing centre, its industries embracing various chemical products, as aniline, white lead, vaseline, celluloid, metal goods, leather and leather goods. Offenbach was founded in the tenth century, and in 1685 it became the residence of the Counts of Isenburg-Birstein, being annexed to Hesse in 1816. Pop. (1919), 75,380.

Offenburg, a town of Baden, Germany, on the Kinzig. It possesses a statue of Sir Francis Drake commemorating the introduction of the potato into Europe, and a castle destroyed in 1689 and rebuilt about 1834–5. Manufactures include tobacco, cotton, machines, stained glass, and dyes. Pop. (1919), 16,240.

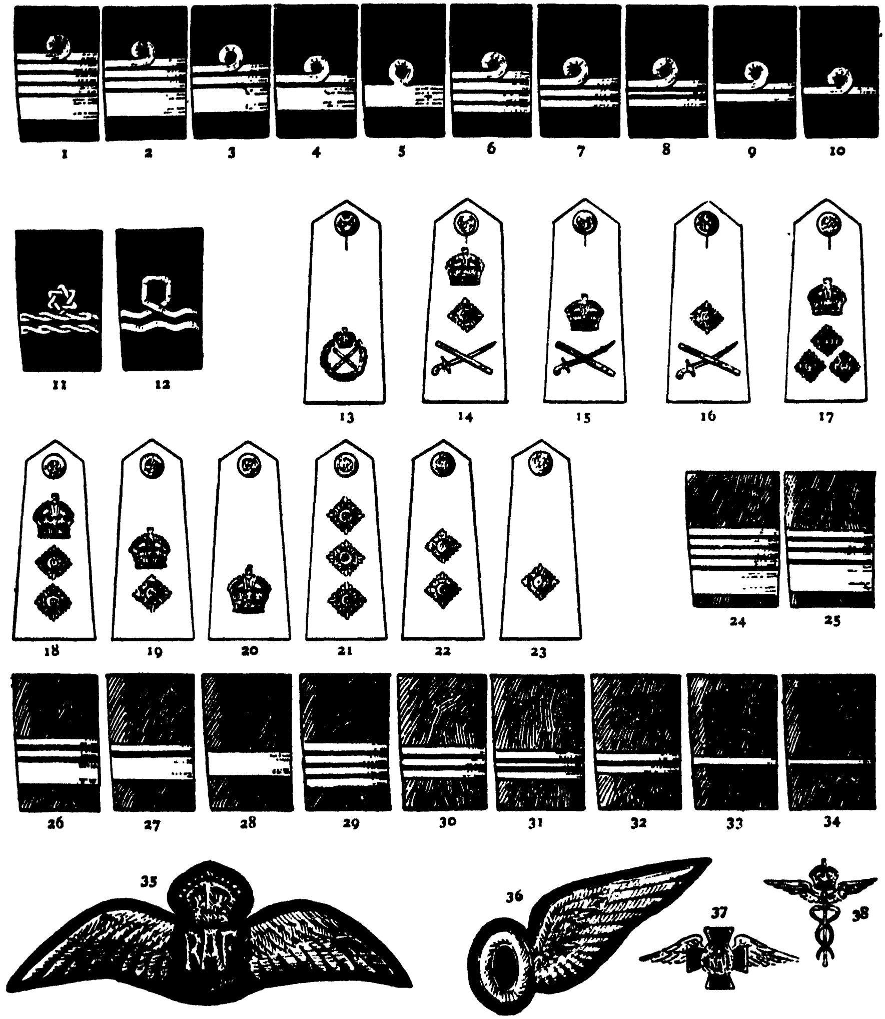
Offence, in the widest sense, any breach of the criminal law or of statutory regulations; more particularly, in English law, any act less grave than an indictable crime or misdemeanour, but yet subject to a penalty by way of fine or imprisonment or otherwise.

Offertory, that portion of the service of the Eucharist in which the offerings of the congregation are made, whether these consist of bread and wine or alms. The term is used in the Roman Catholic Church to denote that portion of the Mass which is being sung when the priest offers the bread and wine; while in the Church of England it is applied to the sentences read from the service when the alms are being collected, or is applied to the alms themselves.

Officers (Military). The commissioned officers of the army as distinct from the warrant and non-commissioned ranks. The word is derived from the Latin *officium*, through the French, and in its original meaning implies 'one who holds an office'. In the army its meaning is exclusively as above, the prefix 'commissioned' being understood. In earlier times—the seventeenth century—the word commissioned was used in its substantive form, i.e. 'commission officer', and the prefix was in more general use than it is now; but, whether used with prefix or without, the word officer implies that he who is entitled to the description becomes so in virtue of the fact that he holds the King's Commission. The Army Act defines the word as follows: "The expression officer means an officer commissioned or in pay as an officer in His Majesty's Forces, or any arm, branch, or part thereof; it also includes a person who, by virtue of his Commission, is appointed to any department or corps of His Majesty's service, or of any arm, branch, or part thereof; it also includes a person, whether retired or not, who, by virtue of his Commission or otherwise, is legally entitled to the style and rank of an officer of His Majesty's said forces".

Every officer on first appointment is given a parchment document known as a 'Commission', which is signed by the Secretary of State for War and countersigned by the Sovereign. This commission appoints the recipient to be "an officer in our (Land) Forces . . . in the rank of second-lieutenant, or in such higher rank as we may from time to time hereafter be pleased to promote you". Then after reciting the duty of an officer to "exercise and well discipline in arms both the inferior officers and men serving under you . . .", it continues, "and we do hereby command them to obey you as their superior officer, and you to observe and follow such orders and directions as from time to time you shall receive from us or any superior officer according to the Rules and Discipline of War . . .".

The different grades or ranks of military officers in the British army are: second-lieutenant, lieutenant, captain, major, lieutenant-colonel, colonel, colonel on the staff, colonel-commandant, major-general, lieutenant-general, general, field-marshal. Those of colonel on the staff and colonel-commandant are perhaps more in the nature of appointments than ranks, but as the latter of of the two replaces the old rank of brigadier-general, and both wear a special badge consisting of 'a crown above three stars, the two lower stars side by side', they are included here. Of the other ranks that of captain is the oldest, followed by lieutenant (holding the place of *locum tenens*). The rank of major was originally 'sergeant-major', and colonel is derived probably from Italian or Spanish. In the seventeenth and early eighteenth century the highest rank in the army was that of the 'captain-general', that of field-marshal being of more modern origin.



Officers: Marks of Rank

Navy.—Navy-blue with gold sleeve lace. 1, Admiral of the Fleet. 2, Admiral. 3, Vice-Admiral 4, Rear-Admiral and Commodore (1st class). 5, Commodore (2nd class). 6, Captain 7, Commander. 8, Lieutenant-Commander. 9, Lieutenant. 10, Sub-Lieutenant and Mate

Royal Naval Reserve.—11, Lieutenant (other ranks vary as in the Navy).

Royal Naval Volunteer Reserve.—12, Lieutenant (other ranks vary as in the Navy).

Navy, Civil Branch.—Engineer Officers wear purple cloth between the gold stripes of their rank; Medical Officers wear red cloth between the stripes; Dental Officers, orange cloth; Paymasters, white; Instructors light-blue. The ordinary naval nomenclature is used to describe all ranks, as ' Surgeon Admiral ', ' Engineer Vice-Admiral ', ' Instructor Captain ', &c.

Army.—Khaki-coloured cloth; shoulder-straps with badges in embroidery or metal 13, Field-Marshal. 14, General. 15, Lieutenant-General. 16 Major-General. 17, Colonel-Commandant. 18, Colonel. 19, Lieutenant-Colonel. 20, Major. 21, Captain. 22, Lieutenant. 23, Second-Lieutenant.

Royal Air Force.—Grey-blue, gold lace for full dress, black and blue lace for service dress. 24, Marshal of the Air. 25, Air Chief Marshal. 26, Air Marshal. 27, Air Vice-Marshal. 28, Air Commodore. 29, Group Captain. 30, Wing Commander. 31, Squadron Leader. 32, Flight Lieutenant. 33, Flying Officer or Observer Officer. 34, Pilot Officer. Breast Badges:—35, Pilot. 36, Observer. Cap Badge:—37, Chaplain. Collar Badge:—38, Medical Officer.

Officers (Naval). The principles governing appointments to commissions in the Royal Navy are similar to those which apply peculiarly to the Army, but the mode of procedure is somewhat different, and the vast amount of both general and specialized knowledge required of the average naval officer makes it necessary for him to begin his apprenticeship to the sea at a very early age. Naval officers are divided into two great classes, executive and administrative. The former are directly concerned with navigation and with offensive or defensive action; the latter class includes paymasters, surgeons, and engineers. Formerly the executive ranks had the privilege of wearing what is known as the 'executive curl', i.e. a curl over the topmost gold braided ring indicating rank, while the administrative officers wore plain gold-braided bands with colours between, indicative of their branch. The administrative ranks had also a distinctive nomenclature, such as fleet-paymaster or fleet-surgeon. Since the European War all distinction between both classes has been eliminated, excepting as regards the colour-band, which, in a reddish colour, indicates a surgeon, in white a paymaster, and in purple an engineer. During battles at sea the paymaster's department performs definite duties in carrying wounded, &c. Naturally, the administrative ranks are highly specialized as apart from the Royal Navy. For executive rank a naval cadet enters a recognized training college at from twelve to thirteen years of age, and eventually becomes a midshipman (q.v.), known in naval parlance as a 'snotty'. As a midshipman he takes part in all shipboard routine, and eventually attains the rank of sub-lieutenant. The executive ranks, with their Army and Air Force equivalents, are as follows:

ROYAL NAVY[1]	ROYAL ARMY
1. Admiral of the Fleet.	1. Field-Marshal.
2. Admiral.	2. General.
3. Vice-Admiral.	3. Lieutenant-General.
4. Rear-Admiral.	4. Major-General.
5. Commodore.	5. Colonel-Commandant.
6. Captain.	6. Colonel.
7. Commander.	7. Lieutenant-Colonel.
8. Lieutenant-Commander.	8. Major.
9. Lieutenant.	9. Captain.
10. Sub-Lieutenant.	10. Lieutenant.
11. Midshipman.	11. Second-Lieutenant.

ROYAL AIR FORCE

1. Marshal of the Air.
2. Air Chief Marshal.
3. Air-Marshal.
4. Air Vice-Marshal.
5. Air-Commodore.
6. Group Captain.
7. Wing-Commander.
8. Squadron Leader.
9. Flight-Lieutenant.
10. Flying Officer (or Observer).
11. Pilot Officer.

See *Warrant Officer*.

Official Receiver, in England, a public official who performs certain duties in the bankruptcies of individuals and the winding-up of companies. He investigates the circumstances of a bankruptcy, and reports to the court with a view to a prosecution in the event of any misdemeanour under the Bankruptcy Acts, takes charge of the estate until a trustee is appointed, and generally supervises the trustee when appointed, or himself acts as trustee in small bankruptcies, &c. His duties in the winding-up of a company are similar. See *Liquidator*.

Official Secrets. It is a felony for any person, for a purpose prejudicial to the State, to enter or be near a prohibited place (dockyard, factory, camp, defence-work, &c.), or make or communicate any such sketch, model, note, or document, or give any such information as is likely to be useful to an enemy. It is a misdemeanour for any person to communicate to an unauthorized person any secret official code or password, or any information relating to a prohibited place, that may have been entrusted to him or obtained by virtue of his office, or to retain any document, &c., relating to a prohibited place, or any official document, after his right or duty therewith has ceased; or for any person finding or otherwise coming into possession of any official document not to restore it to the person by whom it was issued or to a police constable. (See the Official Secrets Acts, 1911 and 1920.)

Og, King of Bashan at the time of the conquest of Canaan by the Israelites, by whom he and his people were destroyed. He has been transformed by rabbinical fables into one of the giants who lived before the flood, and escaped the general inundation by taking refuge on the roof of Noah's ark.

Ogden, a city of Utah, United States, the county seat of Weber county, at the confluence of the Weber and Ogden Rivers, and served by the Union Pacific, Southern Pacific, and Denver & Rio Grande Railways. It stands at an altitude of 4338 feet in the Wahsatch range, and in an agricultural and mining area. It was laid out by Brigham Young in 1850, and became a city in 1851. Pop. (1920), 32,800.

Ogdensburg, a city and port of entry of New York, United States, in St. Lawrence county. It stands at the confluence of the Oswegatchie with the St. Lawrence River, and is served by the Rutland and the New York Central & Hudson Railways, and by lake and river steamers. The city became the see of a Roman Catholic bishop in 1872. Ogdensburg was settled in 1749 as the Indian settlement of La Presentation (founded by Abbé Piquet, 1708–81, for converted Iroquois), and became a city in 1851. Pop. (1920), 32,800.

Ogee (ō-jē'), in architecture, a moulding consisting of two members, the one concave, the other convex, or of a round and a hollow; otherwise called a *cyma reversa.* (See *Cyma.*) An *ogee arch* is an arch with a similar curve.

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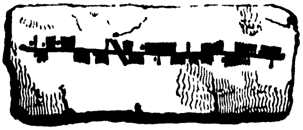
[1] In by-gone times there was a Master who performed navigating duties under the Captain. A Paymaster equivalent in rank to a Commander is a Paymaster-Commander. Similarly other administrative ranks are addressed as Surgeon-Commanders, Engineer-Commanders, and so on upwards or downwards in grade as the case may be.

Og'ham, or **Ogam**, a particular system of writing formerly practised by the Celtic peoples of Ireland, Scotland, and Wales. It is chiefly found in inscriptions on stone, but also, though more rarely, in books. The Ogham characters (also called *oghams*) consist principally of lines or groups of lines deriving their significance from their position on a horizontal or chief line, under, over, or through which they are drawn either perpendicular or oblique; curves rarely occur. Authorities differ as to the total number of letters represented in the alphabet, some making sixteen, others twenty-five. Regarding the age of this form of writing, it is now supposed that it was used not only in prehistoric times, but also so late as the ninth and tenth centuries. Stones with ogham inscriptions are found in Leinster and Connaught, also in some parts of Wales.—Cf. R. A. Stewart Macalister, *Studies in Irish Epigraphy.*



Ogham Inscription, from a stone found near Ennis

Oglio (ol'yō), a river of North Italy, which rises in the Alps, drains Lake Iseo, and falls into the Po; length, 150 miles.

O'Higgins, an inland province of Central Chile, partly traversed by the Andes. Wheat, wine, and fruit are produced; gold is worked; cattle-raising is progressive. Rancagua is the capital. Area, 2168 sq. miles; pop. (1919), 129,992.

Ambrosio O'Higgins (1720–1801), an Irishman, was Captain-General of Chile and Marquis of Osorno (1788), and became Viceroy of Peru in 1796. His son, Bernardo O'Higgins (1778–1842) became Dictator of Chile (1817) and declared its independence of Spain (1818), driving out the Spanish troops. He resigned in 1823, and retired to Lima. The province commemorates the O'Higgins family.

Ohi'o, a river of the United States, formed by the union of the Alleghany and Monongahela at Pittsburg, Pennsylvania. It flows w.s.w., separating the states of Western Virginia and Kentucky on the south from Ohio, Indiana, and Illinois on the north, and enters the Mississippi at Cairo. Its length from Pittsburg to its junction with the Mississippi is 975 miles; area of basin, 214,000 sq. miles. Its principal affluents are the Miami, Kentucky, Wabash, Cumberland, and Tennessee, and on its banks are Pittsburg, Cairo, Cincinnati, Louisville, Evansville, and Mount Vernon. It is the most important commercial tributary of the Mississippi, and the largest after the Missouri.

Ohio, a state in the east-north-central division of the United States, extending north to south between Lake Erie and the state of Michigan and the Ohio River, and partaking of the nature of a rolling plain sloping to the south and to the east. The state capital is Columbus (pop. 1920, 237,031); other cities are: Cleveland (pop. 1920, 796,836), Cincinnati (401,158), Toledo (243,109), Akron (208,435), Dayton (153,830), Youngstown (132,258), and Canton (87,091). There are no important navigable inland waterways, and transport is dependent primarily upon the railways, which include the Missouri; Kansas & Texas; the St. Louis & San Francisco; the Atchison, Topeka, & Santa Fé; the Chicago; and the Rock Island & Pacific Railways. The railway mileage for 1918 was 9160, besides 3227 miles of electric track. Agriculture is the principal industry, producing maize (162,099,000 bushels in 1920), oats (71,339,000 bushels), wheat (28,698,000 bushels), tobacco (63,000 acres, yielding 60,480 lb.), and sugar-beet. Dairy-farming, and horse-, sheep-, and cattle-breeding are important. There are extensive manufactures of butter and cheese, and also a meat-packing trade. Ohio ranks fourth in mineral production of the United States, coal and clay being the chief products. Petroleum, sandstone, limestone, salt, grindstones, and mineral-waters are also found. Education is compulsory between the ages of six and fifteen years. There are five state normal schools and forty universities and colleges, among which are the State University at Columbus (founded 1872), Cincinatti University (1874), State universities at Athens (1809) and Oxford (1824), and a School of Applied Science at Cleveland, established in 1880. Area, 41,060 sq. miles (300 sq. miles being water), exclusive of 3443 sq. miles on Lake Erie. Pop. (1920), 5,759,394.

Ohio was admitted to the Union in 1803. There are eighty-eight counties. Modern government comprises a Governor and a Legislature, consisting of a Senate (37 members, elected for two years) and a House of Representatives (125 members, elected for two years). Two Senators and 22 Representatives are sent to Congress. —BIBLIOGRAPHY: E. O. Randall and D. J. Ryan, *History of Ohio* (5 vols.); E. L. Bogart, *Financial History of Ohio*; R. King, *Ohio* (in American Commonwealth Series).

Ohlau, a town of Upper Silesia, at the confluence of the Ohlau and Oder, near Breslau, and on the railway to Cracow. It was a residence of the Sobieski family, and became a town in

1290. In 1919 it was included in the Silesian plebiscite area after belonging to Prussia since the annexation of Silesia in 1742. Pop. about 9000.

Ohligs, a town of Prussian Rheinland, with foundries, mills, and manufactures of cutlery and steel products. It is a railway junction on the line to Cologne. Pop. 20,000.

Ohm (ōm), Georg Simon, German physicist, born 1787, died 1854. He became successively professor of physics at Cologne, director of the Polytechnic at Nürnberg, and professor of physics at the University of Munich. Ohm was the discoverer of what is known as ' Ohm's Law ' in electricity; and among his scientific works were *Die Galvanische Kette* and *Grundzüge der Physik*.

Ohm, the unit of resistance to the passage of electricity defined at the International Conference on Electrical Units held in London, Oct., 1908, and established as the legal standard in Britain by Order in Council in 1910. The ohm is defined as the resistance to an unvarying electric current by a column of mercury of constant cross-section which has a mass of 14·4521 grammes and a length of 106·300 centimetres. The mercury must be kept at the temperature of melting ice during the observation.

Ohmmeter, a direct-reading instrument used to measure resistance; commonly resistances of great magnitude such as those of insulation. The instrument has two coils with the same number of turns of wire and with their axes at right angles. The needle suspended in these coils is deflected by an amount depending on their resultant action. One coil is connected to a known resistance, and the other to the unknown resistance. With a fixed voltage-supply the deflection will depend on the value of the unknown resistance, and the scale is graduated to give its magnitude in megohms. In Evershed's megger, which is the type generally used, a permanent magnet frame is used, and the two coils at 45° to each other are used as the moving system. The two circuits are connected in parallel to the brushes of a hand-driven generator, which provides an electrical supply at 500 volts.

Ohm's Law, an important law in electricity, deduced by Georg Simon Ohm, to the effect that *the intensity of the electric current is directly proportional to the whole electro-motive force in operation, and inversely proportional to the sum of the resistances in the circuit.* See *Electricity*.

Ohnet (ō-nā), Georges, French novelist and dramatist, born at Paris in 1848, died 1918. He entered the legal profession, but soon abandoned it for journalism. In 1875 his play, *Regina Sarpi*, was produced with great success in Paris, and shortly afterwards he began his series of social novels entitled *Les Batailles de la vie*. He also wrote others, and successfully dramatized several of his novels. His novels give a generally faithful picture of the tastes, feelings, and general mode of life of the French bourgeoisie, and they are in some measure representative of a revolt against naturalism. Among his best-known novels are: *Le Maître de forges* (1882), *Le Brasseur d'affaires* (1901), *La Grande Marnière*, *Le Revenant* (1913).

Oid'ium, a genus of microscopic Fungi. *O. Tuckeri* is the conidial stage of *Uncinula spiralis*, the vine mildew, parasitical, in the form of a white and very delicate layer, upon the leaves and green parts of vines, and destroying the functions of the skin of the part it attacks. Powdered sulphur and a spray of sulphide of potash are effective remedies.

Oil-beetle, the name given to beetles belonging to the genus Meloë, and the family Cantharidæ, from the oily-like matter which they exude. The perfect insects have swollen bodies, with shortish elytra, which more or less overlap each other, and have not a straight suture, as in most coleopterous insects.

Oil-cake, a cake or mass of compressed linseed or rape, poppy, mustard, cotton, and other seeds from which oil has been extracted. Linseed-cake is much used as a food for cattle, its value as a fattening substance being greater than that of any kind of grain or pulse. Rape-cake is used as a fattening food for sheep. These and other oil-cakes are also valuable as manures.

Oil City, a city of Pennsylvania, United States, in Venango county, on the Alleghany; served by the Pennsylvania, the Erie, and the Lake Shore & Michigan Southern Railways. It is the centre of the West Pennsylvania oil-fields (discovered in 1859), and has large refineries. Oil City was settled in 1825, and became a city in 1871. Pop. 18,300.

Oil-engine. See *Internal-combustion Engine*; *Motor-car Engine*.

Oil-gas, the inflammable gas obtained by allowing oils, such as shale-oil or petroleum, to drop into hot metal retorts. The oils actually employed are those too heavy to use for burning purposes, e.g. shale-oil with a specific gravity 0·840. It is used as a substitute for coal-gas in lighting railway-carriages, since it has a higher illuminating power, is free from sulphur, is readily compressed, and is inexpensive.

Oil of Ben. See *Horse-radish Tree*.

Oil-palm (*Elæis guineensis*), an African tree abounding on the west coast, whose fruit yields palm-oil (q.v.).

Oils consist either of hydrocarbons, as in the mineral oils, or of glyceryl esters of the fatty acids, as in animal and vegetable oils. They are colourless or yellow, lighter than water, and immiscible with it.

Greases and fats are oils that are solid at ordinary temperatures but otherwise of similar composition. The so-called essential oils (q.v.), such as oil of cloves, lemon, eucalyptus, &c., are not true oils, but are related to a class of compounds known as the terpenes.

1. *Hydrocarbon oils* are obtained from the oil shales of Scotland and elsewhere, and also from the petroleum of America, Russia, Burma, and other countries. The shale oils consist mainly of paraffins and olefines. Russian petroleum is composed chiefly of naphthenes, whilst American petroleum contains paraffins mixed with olefines and naphthenes.

For commercial purposes the crude product is distilled and separated into the following lighter and heavier oils:

(*a*) The most volatile and inflammable fractions (specific gravity, 0·66–0·77; boiling-point, 80°–150° C.), consisting of benzene, petrol, and naphtha (q.v.), are used in extracting fats, for the dry cleaning of garments, in the preparation of paints as a substitute for oil of turpentine, and as a fuel for internal-combustion engines.

(*b*) Illuminating oils, such as so-called paraffin oil, petroleum, and kerosene (specific gravity, 0·78–0·88; boiling-point, 150°–300° C.). These oils are used for burning in lamps, for cleaning machinery, and in the preparation of oil colours.

(*c*) Lubricating oils (specific gravity, 0·89–0·92; boiling-point, over 300° C.). These are yellow-coloured oils more or less viscid in character, and are extensively used for lubricating machinery. Both these and the illuminating oils undergo a process of refining in order to remove deleterious impurities and to improve the colour.

(*d*) Viscous or buttery products, amber to dark-brown in colour, which are mainly used for lubricating the cylinders of steam, gas, and internal - combustion engines. Vaseline also belongs to this class of oils.

All the above fractions consist of more or less complex mixtures of hydrocarbons, and are chemically neutral and inert. At ordinary temperatures the strongest acids and alkalies have no action on them. The residue left in the distilling retorts is used as a source of fuel for the distillation of the crude oil.

2. *Animal and vegetable oils* are obtained from animal fats and the seeds of various plants by pressing, or by extraction with volatile solvents. These fats and oils consist mainly of tristearin, tripalmitin, and triolein, and can be readily decomposed by means of superheated steam into glycerine and a fatty acid (stearic, palmitic, oleic acid, &c.). On boiling with caustic alkalies, soap (q.v.) and glycerine are produced. These oils are insoluble in water, only slightly soluble in alcohol, but dissolve readily in ether, benzene, chloroform, carbon bisulphide, and petroleum spirit. Their specific gravity varies from 0·88–0·96. They cannot be distilled unchanged, but on heating they are partially decomposed.

The fatty oils may be divided into three groups:

(*a*) Drying oils, which absorb oxygen and harden when exposed to the air. These are largely used in the preparation of paints, varnishes, &c., and comprise linseed, hemp, poppy-seed, fir-seed, and Chinese-wood oils.

(*b*) Semi-drying oils, e.g. rape, colza, cotton-seed, castor, sesame, croton, and grape-seed oils. These become thicker on exposure to air, but do not completely harden.

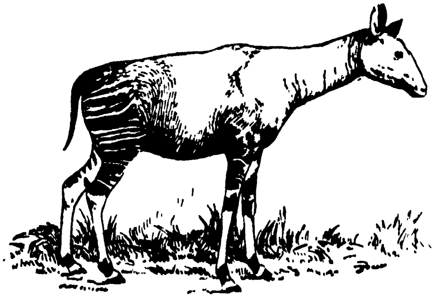
(*c*) Non-drying oils, such as olive, almond, sperm, cod - liver, seal, whale, neatsfoot, coco-nut, palm, and also tallow, lard, and butter. Palm - oil and tallow are largely used in the manufacture of soaps and candles. Sperm and colza oils are mainly used for burning in lamps; butter and lard and the purest forms of olive, cotton-seed, coco-nut, and sesame oils are used almost exclusively for purposes of food, whilst castor, almond, coco-nut, and coco-butter oils are used medicinally. See *Paraffin*; *Petroleum.*

Oise (wäz), a river in France, which rises in the Belgian Ardennes, flows south-west across the department of Oise, and joins the Seine on its right bank about 6 miles below Pontoise; total course, 186 miles, 60 miles of which are canalized. The battle of the Oise began on 16th Aug., 1918 (European War), and in his advance between the Aisne and Oise General Mangin secured 18,000 prisoners and about 300 guns.

Oise, a northern department of France, drained by the Oise, Aisne, Nonette, Ourcq, and Brèche; area, 2272 sq. miles. A considerable part of it is devoted to wheat, and dairying is extensively practised. Barley, oats, and rye are also raised. The vine is not much cultivated but fruits are abundant, and much cider is made. The manufactures are unimportant. Beauvais is the chief town; others are Compiègne, Chantilly, Noyon, Clermont, and Senlis. The department was partly invaded by the Germans in Aug.–Sept., 1914, and again, during their last drive, in the summer of 1918. Pop. (1921), 387,760.

Oka, a river of Central Russia, which rises in the government of Orel, and after a course of 800 miles, navigable from Orel, joins the Volga at Nijni-Novgorod.

Oka'pi (*Ocapia Johnstoni*), an African ruminant closely related to the giraffe, discovered, though not actually seen alive, in Uganda by Sir H. H. Johnston in 1899–1900. It lives in the densest parts of the forests bordering the Semliki River, on the frontier of Uganda and the Congo Free State, and is of the size of a large antelope or mule, without horns or other similar appendages. The ears are larger than those of the giraffe, and the bony cores of the latter species are represented in the okapi by mere bumps. The legs and the hinder part of the body are striped in a zebra-like fashion. These animals generally go about in pairs, male and female, and live chiefly on leaves.



Okapi (*Ocapia Johnstoni*)

Okayama, a town of Honshu, Japan, on the Lower Asahi River, and served by railways to Shimonoseki, Tatai, Uno (for Shikoku), and Tsuyama. Rice, cottons, silks, and yarns are produced. Pop. (1919), 96,446.

Okeecho'bee Lake ('Big Water'), a shallow lake in Southern Florida; 40 miles long, 25 miles broad; maximum depth, 12 feet; now partially drained by a canal to the Caloosahatchee River, thus giving a water-way to the interior.

Okehampton, a town of Devonshire, England; served by the London & South-Western Railway. It was a borough in 1086, and had a castle. There are remains of the chapel, &c., of a fifteenth-century castle. Pop. (1921), 3456.

Okhotsk, Sea of, an arm of the Northern Pacific, enclosed by Kamshatka, the Kuriles, Yezo, and Sakhalin. On the north shore is Okhotsk, a town of the Maritime Province of Russia. There is extensive whaling.

Oki Islands, a Japanese four-island archipelago in the Japan Sea, due north of Izumo province. The largest island is Dogo, containing the capital, Saigo, which maintains a regular cross-channel service with Sakai on the mainland (44 miles). Area, about 131 sq. miles.

Oklahoma, a city of Oklahoma, United States, the state capital and the county seat of Oklahoma county, on the Canadian River (North Fork); served by the Missouri, Kansas & Texas; the Atchison, Topeka, & Santa Fé; and by other railways. It is the seat of Epworth University (founded 1901), and has a large trade. Settled in 1889, it became a city in 1891. Pop. (1920), 91,258.

Oklahoma, a state in the west-south-central division of the United States, part of the great basin of the Mississippi, traversed by the Arkansas, Cimarron, Red, and Canadian Rivers, which frequently dry up during the summer. Oklahoma City is the state capital; other cities are Muskogee (30,277), Tulsa (72,075), Enid (16,576), and Ocmulgee (17,430). In 1920, 6530 miles of steam and 331 miles of electric (1922) railway traversed the state, including the Atchison, Topeka, & Santa Fé; the Chicago, Rock Island, & Pacific; the Missouri, Kansas, & Texas; the St. Louis & San Francisco; and the Santa Fé Pacific Railways. Indian Reservations occupy an area (1920) of 5 sq. miles; pop. 119,255. Oklahoma is an agricultural state, producing maize (89,320,000 bushels in 1920), wheat (46,240,000 bushels), oats (48,000,000 bushels), sorghum, potatoes, flax, fruit, and cotton (2,765,000 acres produced 1,300,000 bales, 1920). Dairying is progressive, and the western part of the state is devoted to stock-raising. Petroleum, oil and natural gas, coal, zinc, and lead are found. Manufacturing industries include cotton-ginning, cotton-seed products (oil and cake), and flour-milling. Whites and negroes are separated for educational purposes, all colours other than negro being classified officially as white. There is a State system of education, embracing all grades from elementary to professional instruction. The State University at Norman was founded in 1892; there is an Agricultural and Mechanical College at Stillwater (founded 1891), and an Agricultural and Normal University at Langston (founded 1897) for negroes. Area, 70,057 sq. miles (643 sq. miles being water); pop. (1920), 2,028,283.

The state of Oklahoma was constituted on 16th Nov., 1907, and comprises the former Indian Territory and the Territory of Oklahoma. Government consists of a Governor and a Legislature, comprising a Senate (44 members, elected for four years) and a House of Representatives (from 99 to 102 members, elected for two years). Two Senators and 8 Representatives are sent to Congress.

Olaf II, or **St. Olaf**, one of the most celebrated of the Norwegian kings, great-great-grandson of Harald Haarfagr, and son of Harald, chief of the district of Gränland, was born about 995, died in 1030. He was a friend of the Normans, and fought as an ally of Ethelred's in England. He afterwards established himself on the throne of Norway, and was a zealous supporter of Christianity. Canute the Great having landed in Norway with an army, Olaf fled to Russia, and in attempting to recover his dominions he was defeated and slain at the battle of Stiklestad. Since 1164 he has been honoured as the patron saint of Norway. The Order of St. Olaf, a Norwegian order given in reward for services rendered to king and country or to art and science, was founded in 1847 by King Oscar I.

Old Age Pensions. Notwithstanding long advocacy by social reformers, it was not until 1909 that the first statute (The Old Age Pensions Act, 1908) providing for State grants to aged persons came into force. The maximum pension under that Act was *5s.* per week, and the limit of income for receipt, of any pension, £31, *10s.* per annum, but from time to time the rates have been increased, and under an Act of 1919 are now as follows: *10s.* per week when the yearly income does not exceed £26, *5s.*; *8s.* when it exceeds £26, *5s.* but not £31, *10s.*; *6s.* when it exceeds £31, *10s.* but not £36, *15s.*; *4s.* when it exceeds £36, *15s.* but not £42; *2s.* when it exceeds £42 but not £47, *5s.*; and *1s.* when it exceeds £47, *5s.* but not £49, *17s.* *6d.* If the income exceeds £49, *17s.* *6d.*, no pension is payable.

Certain other qualifications were necessary. Thus the claimant must have attained seventy years of age, have been a British subject for the preceding ten years, and have resided in the United Kingdom for twelve years since attaining age fifty if he is a natural-born British subject, and for twenty years if he is not natural-born. Under the Finance Act 1925 all contributors to the new Insurance scheme, male and female, over 65 years of age, will receive from 2nd Jan., 1928, *10s.* per week irrespective of means or test, and an insured person over 70 years of age at 2nd July, 1926, or who attains that age before 2nd Jan., 1928, is entitled to receive, without inquiry as to means, residence, or nationality, a pension of *10s.* per week for life, and *10s.* per week for life to wife or widow if and when she attains the age of 70.

For the purposes of the Acts the income of a claimant may be (1) income from investments or property capable of investment; (2) other income reasonably expected to be received in cash during the succeeding year (except sickness benefit under a medical certificate during three months in any year); and (3) the yearly value of any benefit or privilege enjoyed by the claimant, e.g. free board and lodging, or the advantage accruing from the use of property personally enjoyed by him except furniture and personal effects. Income under head (1) is not the actual yield from the investments but is a percentage of the capital value. The first £25 of capital value is disregarded; the income from the next £375 is taken as 5 per cent and from the balance 10 per cent. The income of each of a married couple living together in the same house is taken to be one-half of the total income of the couple.

By the Blind Persons Act, 1920, a person unable to follow an employment through blindness may obtain a pension at age fifty on similar conditions.

At the end of the fiscal year 1923–4 there were 895,924 persons in receipt of pensions, amounting in the aggregate to more than £23,000,000. The cost is a charge on the Imperial Exchequer.

Old Bailey, the sessions-house, in London, in which the Central Criminal Court holds its monthly sittings for the trial of offences committed within the city and county of London, the county of Middlesex, and some parts of the counties of Surrey, Kent, and Essex. It is situated in a street of the same name, running from Ludgate Hill to Smithfield. The Old Bailey is described by Dickens in *A Tale of Two Cities*. It was destroyed by fire in 1780 (during the Gordon Riots), but was rebuilt, and is now officially known as the Central Criminal Court.

Oldbury, a town of England, in the county of Worcestershire, in the heart of a mining district; served by the London & North-Western Railway. It has manufactures of chemicals, iron- and steel-works, edge-tool and nail-works, brick- and tile-works, limestone-quarries, and extensive iron- and coal-mines. Pop. (1921), 36,908.

Oldcastle, Sir John, Lord Cobham, was born in the fourteenth century, in the reign of Edward III, died in Dec., 1417. He obtained his peerage by marrying the daughter of Lord Cobham. He was one of the most prominent of the Lollards, and under Henry V was accused of heresy; but the king, with whom he was a favourite, delayed the prosecutions against him, and tried to convince him of his alleged errors, but in vain. He was then cited before the Archbishop of Canterbury (1413), condemned as a heretic, and sent to the Tower, whence he escaped into Wales. Four years afterwards he was retaken and burned alive. He wrote *Twelve Conclusions*, addressed to the Parliament of England. When Shakespeare's *Henry IV* first appeared, the name given to the fat knight was Oldcastle, but there is not the faintest resemblance between the characters of Falstaff and the Lollard leader.

Old Catholics, religious communities, found chiefly in Germany, Holland, and Switzerland, who have separated from the Church of Rome. The name was first assumed by a party in the Church of Rome who, led by Dr. Döllinger, professor of ecclesiastical history at Munich, refused to accept the decree of the Vatican Council of 1870, teaching and defining the universal jurisdiction and personal infallibility of the Pope. Though united in protesting against the new dogma, the Old Catholics claim to be faithful to the ancient traditional constitution of the Church; have never seceded from it; and still hold they have a joint interest in its possessions. The chief centres of the Old Catholic movement are the universities of Germany; but the movement spread also in Switzerland. At the first Old Catholic congress, held at Munich, Sept., 1871, it was determined to form separate congregations for the body, and to enter into a close connection with the Church of Utrecht (the so-called Dutch Jansenists). After this the Old Catholic movement spread more rapidly. At their second congress, held at Gürzenich, 1872, the Old Catholics resolved to elect Dr. Joseph Reinkens as their first bishop. At the third congress, held in 1873 at Constance, a synodal constitution was adopted. The Old Catholic movement in Germany was greatly aided from the first by the position taken up by the Imperial Government, and still more by the Governments of some of the separate states. The Imperial Government declared the right of Old Catholics to retain what offices they held, and the emoluments of these offices, in spite of any sentence of excommunication passed on them by their bishops. The Old Catholic movement has had a similar course in Switzerland. There also the bishops unanimously supported the new dogma, and excommunicated the priests who rejected it; but there also the State intervened, and zealously protected the latter. The Jansenist Church in Holland is affiliated with the movement.—BIBLIOGRAPHY: C. J. Loyson, *Catholic Reform*; A. M. E. Scarth, *The Story of the Old Catholic and Kindred Movements.*

Oldenburg, a free state in the north of Germany, consisting of three separate and distinct territories, viz. Oldenburg, Lübeck, and Birkenfeld; total area, 2782 sq. miles. (1) The first of these divisions, Oldenburg, is bounded on three sides by Hanover and Bremen. The country is flat; the soil marshy and sandy, with little cultivation and large tracts of heath and forest; there are no hills or lakes; the principal river is the Weser, and the internal navigation is facilitated by a large canal, which connects the Hunte and the Ems. The chief crops are wheat, oats, rye, hemp, and rape. Stock-raising and apiculture are extensive, and there are industries connected with cotton, wool, jute, &c. Pop. (1919), 421,435. (2) Lübeck, situated in East Holstein, north of the town of Lübeck, is bounded partly by the Baltic; area, 210 sq. miles, of which the greater part is cultivated. Chief town, Eutin. Pop. (1919), 45,000. (3) Birkenfeld, situated in Rhenish Prussia, is a hilly country with fertile valleys; area, 194 miles; pop. (1919), 51,260; the chief towns, Birkenfeld and Oberstein. Oldenburg was raised to the dignity of a grandduchy by the Congress of Vienna in 1815, and the greater part of the two principalities was added to its territory. The state became a republic in 1918, the grand duke having abdicated. The republic is now governed by a Landtag consisting of forty-eight members, elected for five years.

Oldenburg, a town of Germany, capital of the free state of Oldenburg, on the Hunte. It has fine promenades on the site of the old fortifications, public library of 150,000 volumes, picture-gallery, gymnasium; manufactures of glass, leather, and earthenware. Pop. 30,240.

Oldham, a municipal and county borough of Lancashire, England, on the Medlock; served by the Great Central, Lancashire & Yorkshire, and the London & North-Western Railway systems, and by canal. The town hall is a copy of the Temple of Demeter (near Athens). There are a museum, an art gallery, and a lyceum with observatory. Spinning and weaving of cotton are the staple industries. Pop. (1921), 145,000.

Oldha'mia, a fossil organism first found in Cambrian shales in County Wicklow, and now known from Cambrian and Ordovician strata elsewhere. It consists of radial or fan-like impressions of rods or tentacles, and has been variously regarded as a plant, a tentaculate worm, and a hydrozoan.

Old Red Sandstone, a geological term made popular by the writings of Hugh Miller, and applied by him to the red sandstone which underlies the Carboniferous system, in contradistinction to the New Red Sandstone, which overlies the latter. It is the freshwater and terrestrial representative of the Devonian system. See *Geology*.

Olea'ceæ, a natural order of gamopetalous dicotyledons, chiefly inhabiting temperate climates. They are shrubs or trees, with opposite simple or compound leaves and small flowers. The species best known are the olive, the lilac, the privet, and the ash.

Olean'der, a plant of the nat. ord. Apocynaceæ, genus Nerium, the *N. Oleander*, known also by the name of rose-bay, a beautiful evergreen shrub, with flowers in clusters, of a fine rose or white colour but of an indifferent smell. The plant, especially the bark of the root, is medicinal and poisonous.

Oleas'ter, *Elæagnus hortensis* (ord. Elæagnaceæ), also called wild olive tree, a small tree of the south of Europe and west of Asia, often cultivated in English gardens and shrubberies especially for its blossoms, which are very fragrant. It flowers in May.

Ole'ic Acid ($C_{18}H_{34}O_2$) exists in many fats and oils as olein. It may be obtained by saponifying olive-oil with caustic soda. Its sodium salt is present in hard soap, and its potassium salt in soft soap.

Olenek', a river of Northern Siberia which rises under the polar circle, and enters the Arctic Ocean to the west of the Lena delta; length, about 900 miles.

Olenellus, a trilobite characterizing the lowest zone of the Cambrian system; the 'Olenellus beds' are thus of importance, as including the earliest well-marked fossil fauna.

Oléron (ō-lā-rōŋ), an island of Western France, about 1 mile from the coast of the department of Charente-Inférieure, to which it belongs. Greatest length, 18 miles; greatest breadth, 7 miles; area, 96 sq. miles. With the exception of the west side the surface is generally fertile, producing good corn and wine. It has two towns, Château and St. Pierre, the former fortified. The population is about 18,000.

Oléron Laws (*Jugements* or *Rôles d'Oléron*), a code of maritime laws which long regulated the navigation connected with La Rochelle, Bordeaux, and the coasts of Normandy and Brittany, and were also adopted in other countries, as Spain, the Netherlands, and England. It was compiled about the end of the eleventh or the beginning of the twelfth century. The code was published for the first time in the *Collection des Lois Maritimes* of Pardessus.

Olfac'tory Nerves, the nerves of smell, the first pair of cranial nerves or nerves connected with the brain. They arise from olfactory cells placed in the lining membrane of the upper part of the nasal cavity.

Olhão (ol-yä'uŋ), a seaport of Portugal, in the province of Faro, noted for its sardine fisheries. Pop. 10,000.

Oligarchy (Gr. *oligos*, small number, and *archē*, government), in politics, a term applied to that form of government in which the supreme power is placed in the hands of a small exclusive class, or of a few individuals. It is the antithesis of *ochlocracy*, or the rule of the crowd. Aristotle distinguishes between the monarchic, aristocratic, and republican (commonwealth) governments, on the one hand, and tyranny, oligarchy, and democracy, the perverted forms of government, on the other. The first three forms of government are in the interest of the public, whilst the latter are selfish, allowing their personal interests to predominate. According to Aristotle, an oligarchy is a government in which the political influence of the wealthy predominates. Thus, according to him, as well as Plato (*Republic*), an oligarchy is really a limited aristocracy. Hobbes (*Leviathan*) maintained that oligarchy is really synonymous with aristocracy, being a term of opprobrium used by opponents of that form of government. In reality, however, there is a vast difference between the rule of an aristocracy and that of an oligarchy. The government of the former is one in which the supreme power is in the hands of an exclusive class, who are, or are considered to be, the best, the élite of the community, whilst the rule of an oligarchy is the perverted form of such a government, the power having been usurped by a few members of the class to the exclusion of their colleagues. The meaning of the term oligarchy has certainly changed since the times of Plato and Aristotle, and an oligarchy need not be based on either birth, blood, wealth, or social position. Even a democracy, when the supreme power is in the hands of a few individuals, is an oligarchy, as is the case in the present Soviet Government of Russia. No oligarchies existed in Asia, where the despotic rule of one individual was prevalent, although the governments of several Phœnician cities were oligarchic. All Greek cities had either aristocratic or oligarchic governments, such as the rule of the thirty tyrants in Athens; and in Rome the rule of the decemvirs and of the triumvirs were also oligarchies. Both in Greece and in Rome aristocratic and oligarchic governments formed the transition between the monarchy and the democracy. During the Middle Ages oligarchies existed in the republics of Genoa, Florence, and Venice. The Grimaldis and Fieschis, the Dorias and Spinolas were the rulers. In Venice the oligarchic rule continued for a considerable time, and was abolished only in 1797. The present Bolshevik government of Russia, in spite of its socialistic and communistic doctrines, is practically an oligarchy, worse than any that history has ever witnessed. Nepálese government is by military oligarchy.

Ol'igocene, a geological system marked out by Beyrich in 1854, and including strata previously assigned to the upper part of Lyell's Eocene system. The European beds are best developed in the Paris basin and Germany; but J. W. Judd showed that in England the system is represented by the 'fluviomarine' series of Hampshire and the Isle of Wight.

Ol'igoclase, a soda-lime felspar, the soda predominating; it occurs in granite, diorite, and other igneous rocks.

Olin'da, a seaport-city of Brazil, in the state of Pernambuco, on the Atlantic, once (for 200 years) the capital of Pernambuco province. It was founded in 1585, and is the seat of a bishopric. There is a wireless station. Pop. 10,000.

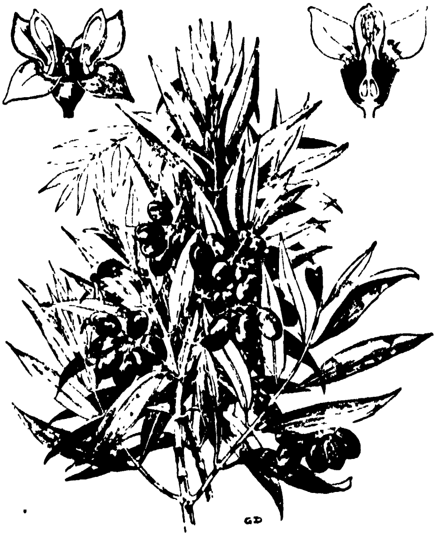
Ol'iphant, Laurence, son of Sir Anthony Oliphant, Chief Justice of Ceylon, was born at Cape Town 1829, died in 1888. He studied law at the University of Edinburgh; travelled extensively in Southern Russia and the Crimea; became private secretary to Lord Elgin when he was Governor-General of Canada, and subsequently accompanied him (1857) on his mission to China and Japan. Returning to Europe, he became Paris correspondent to *The Times*; entered Parliament for the Stirling Burghs in 1865, but retired in 1868. After being connected with a socialistic religious community in the United States, he founded himself a religious community in Palestine, near Mount Carmel.

Besides frequent contributions to periodical literature, he published: *Journey to Khatmandu*, *The Russian Shores of the Black Sea*, *Minnesota and the Far West*, *The Transcaucasian Campaign of Omer Pasha*, *Masollam* (a novel), *Sympneumata*, and *Scientific Religion*, the last works exhibiting his peculiar mysticism and tendency to spiritualism.

Oliphant, Margaret, maiden name Wilson, novelist, born near Musselburgh, Scotland, 1828, died 1897. Her first novel, published in 1849 under the title of *Passages in the Life of Mrs. Margaret Maitland*, won instant attention, and was followed thereafter by more than a hundred books, by which the author maintained a high place as a novelist. Among her best books are: *Squire Arden*, *Lilliesleaf*, *Salem Chapel*, *The Minister's Wife*, *Kirsteen*, and *The Marriage of Elinor*. Besides this fictional work she wrote a *Life of Edward Irving*, lives or memoirs of Francis of Assisi, Count Montalembert, Molière, Cervantes, Sheridan, Laurence Oliphant, &c., *Historical Sketches of the Reign of George II*, *The Makers of Florence*, *The Makers of Venice*, *The Makers of Modern Rome*, a *Literary History of England in the Nineteenth Century*, &c.

Oliva'rez, Gaspar de Guzman, Count of, Spanish statesman, born in 1587, died 1645. Educated at the University of Salamanca, he was appointed gentleman of the bed-chamber to the Prince of Asturias, and when his royal master succeeded to the throne as Philip IV, Olivarez was appointed Prime Minister. For twenty-two years (1621–48) his power was almost unlimited, but the severity of his administration ultimately caused revolt in Catalonia and Andalusia, while the Portuguese threw off the Spanish yoke. The end of his policy was public discontent and his own private disgrace. He was confined by the king at Toro, where he died.

Olive, a fruit-tree of which there are several species, the most important being the common olive (*Olea europæa*, nat. ord. Oleaceæ). It is a low-branching evergreen tree, in height from 20 to 30 feet, with stiff, narrow, dusky-green or bluish leaves. The flowers are small and white, and are produced in axillary racemes, and appear in June, July, and August. The fruit is a seeded drupe of an oblong spheroidal form, with a thin, smooth, and usually blackish skin, containing a greenish soft pulp adherent to a rough, oblong, and very hard stone. It is bitter and nauseous, but replete with a bland oil. The olive is a native of Syria and other Asiatic countries, and flourishes only in warm and comparatively dry parts of the world. It grows slowly, and is very long-lived. The olive tree has in all ages been held in peculiar estimation. It was anciently sacred to Athene. Olive wreaths were used by the Greeks and Romans to crown the brows of victors, and it is still universally regarded as an emblem of peace. The wood of the olive tree is beautifully veined, and has an agreeable smell. It is in great esteem with cabinet-makers on account of the fine polish of which it is susceptible. But the olive tree is principally cultivated for the sake of its oil, which is contained in the pericarp or pulp. (See *Olive-oil.*) It is cultivated for this purpose in Italy, France, Spain, Malta, European and Asiatic Turkey, the Ionian Islands, &c., and is easily propagated either by seed, grafting, or slips. It is very tenacious of life. The fruits are also used at table, not in the natural state, but generally pickled, the green unripe fruits being deprived of part of their bitterness by soaking them in water, and then preserved in an aromatized solution of salt. Another species of olive, the *O. fragrans*, inhabits China, Japan, and Cochin-China. The flowers are used by the Chinese to mix with and perfume their tea, and also, together with the leaves, for adulterating tea. The only American species (*O. americāna*) is in some districts called *devil-wood* on account of the excessive hardness of the wood and the extreme difficulty of splitting it.



Olive (*Olea europæa*)

Branch with joint. Single flower and section shown above.

Olive-oil, a well-known fixed, non-drying oil obtained by expression from the pulp of the ripe fruit of the olive (*Olea europæa*). It is an insipid, inodorous, pale-yellow or greenish-yellow, viscid fluid, unctuous to the feel, inflammable, insoluble in water, and nearly insoluble in alcohol. It is one of the lightest of the fixed oils. Olive-oil is much used as an article of food in the countries in which it is produced, and to a smaller extent in other countries, to which it is exported also for medicinal and manufacturing purposes. The best olive-oil is said to be made in the vicinity of Aix, in France; the kind known by the name of Florence oil is also of a superior quality, and is mostly used for culinary purposes. By far the largest proportion of the oil brought to England is imported from Italy. Spain also sends a large quantity. The oil is also known as *Sweet-oil.* It is sometimes adulterated with other oils such as cotton-seed, earthnut, lard, poppy, rape, or sesame.

Olives, Mount of, or **Mount Olivet** (known by the Moslems as *Jebel et-Tûr*), a mountain situated on the east side of Jerusalem, from which it is separated by the Valley of Jehoshaphat and the brook Kedron. It is closely associated with the life of Christ. The principal summit has the name of Mount of Ascension, and here stands the modern Armenian chapel of that name. But according to the Scriptures the scene of the Ascension was near to Bethany (*Luke,* xxiv, 50), which is on the farther side of the hill from Jerusalem.

Oliv′etans, a branch of the Benedictine order, founded in 1313 by Tolomei of Siena, in Italy, and named from Monte Oliveto Maggiore near that city, where their first monastery was erected.

Ol′ivine, called also *chrysolite,* is a mineral, olive-green in colour, occurring in basic igneous rocks, such as gabbro and basalt, and in certain meteorites. It is an orthosilicate of iron and magnesium, $(Mg{\cdot}Fe)_2SiO_4$, and readily decomposes into the much softer hydrous silicate serpentine. In its fresh form it is used as a gem, having a suitable hardness, above that of felspar. Olivine may arise in dolomitic limestone from contact-action by igneous rocks, when hydration produces beautiful serpentinous marbles. Almost pure olivine-rocks are known, usually containing chromite, as at the Dun Mountain in New Zealand, and the serpentinous matter filling the famous diamond-pipes of South Africa is derived from olivine-rock.

Ollivier (o-liv-i-ā), **Émile,** born at Marseilles 1825, died in 1913. He studied for the Bar and became an advocate at Paris in 1847; took part in the Revolution of 1848, and was appointed Commissary-General at Marseilles under the Republic. He afterwards entered the Legislative Assembly, where he became one of the leaders of the Liberal opposition. Gradually, however, he became a Conservative, and in 1870 accepted Napoleon's invitation to form a ministry. It was this ministry which declared war with Germany in July, 1870. His later years were devoted to writing *L'Empire libéral.*

Olmütz (ol′müts), a city of Czecho-Slovakia, in Moravia, on the March, which forms almost a complete circle around it. It has a cathedral, erected by King Wenzel III, who was murdered there in 1306; and its manufactures are chiefly of linen and woollen cloth. In 1886 its fortifications were turned into pleasure-grounds. The Convention of Olmütz, between Austria and Prussia, was signed on 29th Nov., 1850. Pop. 50,000.

Olney, a small market-town of England, in the north of Buckinghamshire, near the Ouse. In the market-place is the house in which the poet Cowper resided (1767–86), his friend the Rev. John Newton occupying the rectory; and it was from this place that the *Olney Hymns,* their joint production, received their name. Pop. 2700.

Olonetz′, a northern government of Russia; area, about 49,000 sq. miles. The most marked physical feature of the government is its lakes (including Onega and Ladoga), streams, and morasses (occupying one-fifth of the total area). The climate is rigorous in the extreme. Timber constitutes almost the whole wealth of the government. The chief means of support of the inhabitants are forestry, hunting, and fishing. The capital is Petrozavodsk. Pop. 476,000.

Olstfold, a county or *fylke* of Norway, at the north-east of Christiania Fiord; traversed by the Glommen and by the Christiania-Sweden Railway. Fredrikstad, Sarpsborg, and Fredrickshald are the principal towns. Area, 1750 sq. miles; pop. about 160,000.

Olym′pia, a locality in Greece, the scene of the famous Olympic games, a beautiful valley or plain lying in the middle portion of the ancient district of Elis, in the western part of the Peloponnesus (Morea). Here were collected thousands of statues of the gods and of victors in the games, treasure-houses full of votive offerings, temples, altars, tombs, and in a word the most precious treasures of Grecian art. Among the buildings were the Olympiēum or great temple of Zeus, containing the colossal statue of the god by Phidias; the Heræum or temple of Hera; the Metroum or temple of the mother of the gods; the twelve treasure-houses; the Prytanēum, in which the Olympic victors dined after the contests; the Bouleuterion, in which all the regulations regarding the games were made; and these were all surrounded with walls, having a length of about 1800 feet and a breadth of 1500 feet. Excavations made in the course of last century, in 1829, and from 1875 to 1881, have brought to light numerous valuable works of art, besides remains of ancient buildings, &c.

Olym′piads, the periods of four years between each celebration of the Olympic games, by which the Greeks computed time from 776 B.C., the first year of the first Olympiad, till A.D. 394, the second year of the 293rd Olympiad.

Olym'pias, the wife of Philip II, King of Macedonia, and the mother of Alexander the Great. Her haughtiness, and more probably her infidelity, led Philip to repudiate her, and to marry Cleopatra, the niece of King Attalus. The murder of Philip, which soon followed this disgrace (336 B.C.), some have attributed to the intrigues of Olympias. After the death of her son and his successor Antipater she was besieged by Cassander in Pydna, and, having to surrender, she was put to death after a mock trial (316 B.C.).

Olympic Games, the great national athletic festivals of the ancient Greeks, were so called from being held at Olympia, near Elis in Peloponnesus. Their origin is lost in a remote antiquity; the generally received opinion was that they were established by Heracles, in celebration of a victory, 1222 B.C. Strabo objects to this that Homer would have mentioned them had this been so. Their history is only clearly recorded from 776 B.C., when they were revived and reorganized. From that date onwards they were held every fifth year, or rather in the first month after the lapse of four years from the previous celebration. The principal sites connected with the games were the wooded Sacred Grove, or Altis, about 200 yards square, in which were placed the sanctuaries; the Gymnasium and Palæstra, lying to the west of this; with the Stadium and the Hippodrome, the actual scenes of contest, on the east. It is most probable that in its early days the festival was one of local interest only, organized and taken part in by the Peloponnesians; later other Greek states were attracted to the games, and the assembly became pan-Hellenic; while, after the Roman conquest, the victors themselves took part in the festival, in which both Tiberius and Nero distinguished themselves. Women were excluded, even from being present, upon pain of death, though it is clear that this rule was not always strictly observed, for women are known to have taken part on some occasions, and to have received the victor's crown. For a long time there was but a single superintendent of the games; later two, then twelve, eight, and finally ten officials were appointed. The opening of the games was preceded by a proclamation of universal peace throughout the land. Previous to this all intending competitors had spent ten months of severe training in the gymnasium. The first day of the festival appears to have been devoted to the offering of sacrifices, and to the classing and arranging of the competitors by the judges, previously sworn to strict impartiality and to the rejection of a bribe. On this day there were also contests for the trumpeters. The second day was allotted to boys, who contested in wrestling, boxing, and foot- and horse-racing. Their place was taken on the third day by the men, who engaged in similar 'events', and whose foot-races were of several kinds, as once, twice, and several times over the course. There were, too, races for men clad in heavy armour. On the fourth day took place the *pentathlon*, or five-fold contest, the events of which included running, leaping, wrestling, throwing the discus, and throwing the spear. These were followed by horse- and chariot-races, with contests for the heralds. The proceedings terminated on the fifth day with further sacrifices, processions, banquets to the victors, and the presentation of the crowns. These last, the sole rewards, were of no intrinsic value, being merely wreaths of twigs gathered from the sacred olive tree—believed to have been planted by Heracles—which grew in the Altis. Nevertheless these simple prizes were greatly coveted, and carried with them much honour to their possessors. The victors were received in their native towns with the greatest acclamation; songs—among them fourteen of Pindar's extant lyrics—were composed in their honour; statues were raised to them; they were allotted a prominent position on all public occasions, and were largely exempted from taxation. In 364 B.C. the control of the games was taken over by the Pisæans, and they were finally prohibited and suppressed in A.D. 994 by Theodosius I. The site of Olympia was explored and excavated by German scholars between 1874 and 1881, when, among many other valuable treasures of antiquity, the Hermes of Praxiteles was brought to light. (See Botticher's *Olympia*; also various German works.) The *Olympiad*, or period of four years between the celebration of the games, furnished a mode of reckoning time which was first introduced by Timæus, an historian of the third century B.C. The calculation of an olympiad is from 776 B.C., and the date of any olympiad according to the Christian era is found by subtracting one from the olympiad's number, multiplying by four, and, if the result is less than 776, subtracting it from that number, when the date B.C. will be found. If the number is greater than 776, the difference will be the date A.D.

Olympic Games, Modern. In 1894 representatives of several countries met in Paris on the initiative of the Baron de Coubertin to consider the question of reviving the ancient Olympic Games. As a result of this step the first modern meeting took place in 1896 at Athens, the ancient Stadium being rebuilt with a seating capacity of 45,000. The events included the usual track and other sports, with many modern introductions, such as tennis, cycling, fencing, rifle- and revolver-shooting, and swimming competitions. Among competitors from foreign countries Great Britain was meagrely represented, while the United States achieved a marked success, nine of their athletes securing prizes in every event for which they entered. A striking feature was the Marathon race, commemorative of the bringing to Athens news of the Greek victory at Marathon; the distance was about 26 miles. The two following meetings were held in Paris (1900) and St. Louis (1904). At the latter city a greatly extended programme included numerous competitions for native races, in which American Indians, Africans, Ainus, Filipinos, and others engaged. The results disappointed the expectations of many, for the coloured men proved in most cases far inferior to their white opponents. The Greeks, desiring a meeting of more marked Hellenic stamp, held one at Athens in 1906, the royal families of Greece and England, including the late King Edward VII, being among the spectators. Here the Marathon race was won by Sherring, a Canadian. Two years later the games were held in London, in connection with the Franco-British Exhibition. The prize for the Marathon race, from Windsor Castle to Olympia, went to Hayes, an American; Dorando Pietri, an Italian, who first actually passed the post, being in a state of collapse and helped for the last few yards. He received a special prize from Queen Alexandra. Subsequent meetings have been held at Stockholm (1912) and Antwerp (1920).

Olym′pus, the name given to several mountain ranges by the ancients. The most celebrated of them was situated in Thessaly, at the eastern extremity of the range called the Cambunian Mountains, and now called by the Greeks Elymbos or Olymbos. It rises to the height of 9700 feet above the level of the sea, and was the highest mountain in ancient Greece. The earliest Greeks looked upon it as the highest of all mountains, as the central point of the earth's surface, and as the place where the gods dwelt. In aftertimes Olympus became the synonym for heaven. The other most important elevation bearing this name was the Mysian Olympus, a range of lofty mountains in the north-west of Asia Minor, now called Kheshish Dagh, Ala Dagh, Ishik Dagh, and Kush Dagh. Olympus in Cyprus may also be mentioned.

Omagh (ō′-mă), the county town of Tyrone, Ireland, situated on the Strule; served by the Great Northern Railway. There are a Roman Catholic cathedral, and a Protestant church, and the remains of a castle. Linen and milling are the industries. Pop. about 5000.

O′maha, the largest city of Nebraska, United States, county seat of Douglas county, on the Missouri; served by the Chicago, Milwaukee, & St. Paul, the Illinois Central, the Union Pacific, and six other railway systems. It is the seat of the State and of Creighton Universities, and has also two medical colleges. There are large railway workshops of the Union Pacific, and large silver-, gold-, lead-, and other smelting-works. Omaha was settled in 1854, and became a city in 1857. Pop. (1920), 191,600.

Omán, an independent state of South-Eastern Arabia, on the Gulf of Oman and the Arabian Sea, extending from the borders of El Hasa to Ras Sajir, with a coast-line of 1000 miles. Muscat is the capital, and trade is carried on through the ports of Muscat and Mattrah. The people are Arabs, although there is a strong infusion of negro blood along the coast, Muscat and Mattrah being almost entirely peopled by negroes and Baluchis. The Maria Theresa dollar is in general use, and on the coast the Indian rupee circulates. An Ománese copper coin is the *muhammadi* of 20 *gaj* (11½ muhammadi = 1 dollar). Trade is brisk in dates, fruit, fish, limes, cotton goods, and hides and skins, which are exported mainly to India, the majority of the trade being in the hands of British Indians. Camels are bred in the interior, where the authority of the Sultan is nominal. Area, 82,000 sq. miles; pop. about 500,000.

Ahmed bin Sa'eed founded the dynasty of Yemenite Imams (1741) to which the present Sultans belong. In the nineteenth century the Imam of Omán reigned over a large slice of Arabia, a strip of the Persian coast, and a coastal area south of Cape Guardafui in Africa, which included both Sokotra and Zanzibar. Sultan Sa'eed died in 1856, and by the arbitration of Lord Canning, Viceroy of India, his dominions were divided among the two claimants as the Sultanates of Zanzibar and Omán respectively. The integrity of Omán is guaranteed by Britain and France. See *Muscat*.

Omar I, successor of Abu-bekr, and second Caliph of the Moslems after Mahomet. He was born about A.D. 582, became a follower of Mahomet about 615, and succeeded Abu-bekr in 634. His caliphate is celebrated for the great extension of Mahommedanism which took place while it lasted. He extended his dominion over Egypt, Syria, and Palestine, whilst his generals invaded Persia, defeated the army of Yezdegerd, and conquered the capital and kingdom. He died in 644 at Medina, mortally wounded by a Persian slave. Omar was the first Caliph to bear the title of Commander of the Faithful, and he also established the custom of dating from the Hijra.

Omar Khayyam′, Persian poet, astronomer, and mathematician, born at Nishapur in Khorasan, died there 1123 A.D. His scientific works, which were of high value in their day, have been eclipsed by his *Rubaiyat*, a collection of about 500 epigrams in praise of wine, love, and pleasure, and at the same time depressingly pessimistic. There is an admirable poetic translation of the *Rubaiyat* or *Quatrains* by Edward Fitzgerald (1859).

Omdurman, a city in the Anglo-Egyptian Sudan, on the White Nile, opposite Khartum, and the former capital of the Mahdi's empire. It is the native trading-place of the Sudan. Pop. about 70,000.—The battle of Omdurman was fought on 2nd Sept., 1898, between the combined British and Egyptian troops and the forces of the Khalifa. The dervishes were completely overwhelmed and defeated by Lord Kitchener.—Cf. Winston S. Churchill, *The River War*.

Om'ega (Gr., signifying 'great *o*'), the name for the Greek long *o*. It was the last letter in the Greek alphabet, as alpha was the first; and from the expression in *Rev.* (chap. i, 8), "I am Alpha and Omega, the beginning and the ending", the signs A Ω became with the Christians symbolical hieroglyphics. Inscriptions on tombstones, public documents, &c., very often began with these two letters, meaning, 'In the name of God'.

Ommiades, or **Ommeyades** (om'i-ādz), the second dynasty which held the Arabian caliphate until they in turn were superseded by the Abbasides. The founder of the dynasty was Moawiyah, who claimed the throne after the death of Othman, his cousin, and became fully recognized as Caliph after the death of Ali his rival and Hussein his son. See *Caliph*.

Omnibus, a Latin word signifying 'for all', and now applied in several languages to the well-known vehicle used for the conveyance of passengers at a cheap rate. The first conveyances of the kind were those which came into use in Paris (March, 1662) in consequence of an edict of Louis XIV, but they soon fell into disuse, and were not again reintroduced until 1827. Shillibeer started the first omnibus in London on 4th July, 1829, and they were introduced into New York in 1830, and Amsterdam in 1839. The abbreviation ''bus', originally somewhat colloquial, is now a recognized word. Shillibeer's 'bus was drawn by three horses abreast, but the later type was usually drawn by two horses, and provided accommodation for passengers on the roof. Later developments were a winding stairway and comfortable seats on top. The introduction of motors has completely revolutionized the capabilities and the construction of the 'bus. See *Motor Vehicles*.

Omsk, a town of Siberia, province of Akmolinsk, at the junction of the Om with the Irtish, and on the Trans-Siberian Railway. It contains a cathedral and various other churches, Governor's palace, and military institutions. Pop. 135,000.

On'ager, or **Ghor-kar**, a species of wild ass (*Equus onager*), originally inhabiting the great deserts of West and West-Central Asia, and also of North-West India. See *Ass*.

Onagra'ceæ, a natural order of polypetalous dicotyledons, herbs, trees, and shrubs, with opposite or alternate simple leaves, and often handsome flowers. They have an inferior ovary, and all the parts of the flower are four or a constant multiple of that number. The species chiefly inhabit the more temperate parts of the world, and have white, yellow, or red flowers; such as the great American genus Œnothĕra or evening-primroses, the common wild willow-herbs (Epilobium), and the fuchsias of our gardens.

One'ga, a river of Russia. Issuing from Lake Latcha, government of Olonetz, it flows first north-east, then north-west, and after a course of about 250 miles falls into the White Sea at the south-east extremity of the Gulf of Onega.

One'ga, a lake of Russia, near the centre of the government of Olonetz, and, after Lake Ladoga, the largest lake in Europe, covering an area of about 3800 sq. miles. There are numerous islands and an abundant supply of fish. It discharges into Lake Ladoga by the Svir. The southern shores have been canalized to assist navigation, and Onega is connected by the Vytegra with the Mariinskaya canal-system. See *Murman*.

Oneida (o-nī'da), a lake in the state of New York, United States, the western and lower end of which is about 18 miles south-east of Lake Ontario. It is 20 miles long, 4 miles broad, and its waters find a vent by Oneida River into Lake Ontario at its south-east corner, after they have united with the Seneca and formed the Oswego River.

Oneidas, once a North American Indian tribe or nation belonging to the confederacy of the Hurons, and inhabiting Central New York. A remnant of them now inhabit a reservation in Wisconsin.

Onion, a well-known liliaceous plant of the genus Allium, the *A. Cepa*, the bulbous root of which is much used as an article of food. It is a biennial herbaceous plant with long tubulated leaves, and a swelling, pithy stalk. The peculiar flavour varies much according to the size of the bulb, the small reddish onions having much more pungency than the larger ones. The onion may be grown from the tropics to the coldest verge of the temperate zone. There are at least twenty varieties, the Strasbourg, Spanish, and Portuguese being among the best.

On'kelos, the author of the celebrated *Targum* or Chaldee paraphrase of the *Pentateuch* which bears his name, is asserted by the *Babylonian Talmud* to have lived in the time of the celebrated teacher Gamaliel, but is supposed from internal evidence to be not earlier than the second and not later than the third century. His version is so faithful, and accords so exactly with the Hebrew text, that it continued till the beginning of the sixteenth century to be chanted in the synagogue alternately with the Hebrew and to the same notes.

Onomac'ritos, a Greek poet and mystic, who lived at Athens, arranged and explained the so-called oracles of Musæus, and having been detected making an interpolation in one of these, was banished from Athens by Hipparchus about 516 B.C. He is supposed to have been the author of the *Orphic* hymns.

Onta'rio (formerly Upper Canada, or Canada West), the most populous province of the Dominion of Canada. It is bounded north by the James and Hudson Bays; west by Manitoba; south by the St. Lawrence River, the Great Lakes, and the Rainy River; and east by the Ottawa River, separating it from Quebec. Area, 407,262 sq. miles. The district of Patricia, in the north of the province, was added in 1912. Ontario has many lakes, such as Nipigon, Lake of the Woods, &c. The chief rivers are boundary rivers: the Ottawa, Niagara, and Albany, the last entering James Bay, part of Hudson Bay. The Falls of Niagara in part belong to the province. Ontario consists of two chief divisions, the pensinula between the great lakes and the Ottawa, and the much larger portion to the north-west. The country has no hills of importance. The drainage in eastern Ontario is to the St. Lawrence, that of the north-west is mainly to Hudson Bay. This part is rich in forest and mineral wealth, and has also great stretches of wheat land. Here the climate shows great extremes, while in the south-eastern and peninsular portion it is agreeably tempered by the proximity of the lakes. In this part the crops raised are chiefly wheat, barley, oats, peas, and potatoes, while fruit-growing is successfully carried on. The farmer here also engages in stock-raising and dairy-farming with a success largely due to the easy accessibility of markets by rail, or by lake, river, and canal navigation. About one-half of the milk, cheese, and butter of Canada is produced in Ontario. Immense quantities of pine and pulp-wood are taken from the northern forests. Minerals include the silver of Cobalt, the nickel of Sudbury, copper, iron, lead, gypsum, mica, petroleum, salt, and marble. Coal is lacking, but its place is taken by the water-power supplied by the streams. Chief among manufactures are lumber, paper pulp, paper, furniture, hardware, leather, agricultural implements, steam-engines, &c. Education in the common schools is free, and there is liberal Government provision for high schools and colleges, technical institutions, and the universities. The capital is Toronto, and government is under a Lieutenant-Governor, a Cabinet, and a Legislative Assembly or Parliament of 111 members. Ontario sends 82 members to the House of Commons of Canada, and 24 members to the Senate. The Dominion capital, Ottawa, is in the province, also Hamilton, London, and Kingston. Pop. in 1911, 2,523,274; in 1918, 2,799,000.

Ontario, Lake, the smallest and most easterly of the great Lakes of North America, lying along the north-east side of the state of New York, and forming part of the boundary between the United States and Canada; greatest length, 190 miles; greatest breadth, about 55 miles; area, 5400 sq. miles. It receives the waters of Lake Erie by the Niagara, and discharges its waters by the St. Lawrence into the Atlantic, 1000 miles distant. The Hudson, and the Oswego and Erie Canals, form a connection through the United States between it and the Atlantic. It is navigable throughout its whole extent, but shore ice impedes winter navigation. The most important places on its shores are Toronto, Hamilton, Kingston, and Coburg, in Canada, and Oswego in the United States.

Ontol'ogy, the science of being, dealing with the ultimate principles of material and spiritual phenomena, and investigating reality in its ultimate nature. Aristotle employed the term first philosophy but not ontology, which is sometimes used as synonymous with metaphysics.

The term was first introduced by Christian Wolff (1679–1754), who divided metaphysics into ontology or philosophy of being, psychology or philosophy of mind, cosmology or philosophy of nature, and theology, which deal respectively with being as being, and with the soul, the world, and God. Kant, however, maintained that in dealing with being independently of its representation in consciousness, ontology was attempting a vain and impossible task. He directed his criticism especially against the so-called *ontological proof* of the Divine existence, i.e. the conclusion of the existence of a Supreme Being from the fact that the idea of such a Being is innate. See *Metaphysics*.

Onychia is inflammation of the nails. It may be due to injury, pressure, or exposure to X-rays—traumatic onychia—or it may be due to a small abscess at the edge of the nail—septic onychia. The condition is also seen in general diseases with manifestations elsewhere, as in ringworm, favus, and syphilis.

Onygena, a genus of Ascomycetous Fungi, group Plectascineæ. They are saprophytes growing on decaying horns, hoofs, feathers, &c. *O. equina* is not uncommon on sheep's horns in the Scottish Highlands and other hilly districts.

Onyx, a banded agate, in which dark layers are contrasted with white or milky-grey layers between them

Oodnadatta, a township of South Australia, on the transcontinental railway to Darwin, Northern Territory (q.v.), of which it has been the railhead since 1891. It is about 1300 miles from Darwin and 690 miles from Adelaide. Mica is brought to Oodnadatta by camel transport from Mount Brassey in the Macdonell ranges, 500 miles distant.

Oogonium, the female organ in Thallophytes (Algæ and Fungi), a cell containing one or more female gametes or ova.

Oölite (ō'o-līt), a species of limestone composed of globules clustered together, commonly cemented by calcium carbonate. The granules vary in size from that of small pin-heads to that of peas. When the grains are very distinct and well rounded, it is called roe-stone; when they are large and pea-like, the rock is known as pisolite, pea-grit, or pea-stone. In modern tropical waters, and in desiccating lakes like that of Utah, oölitic grains are formed by the concentric deposition of aragonite round minute organic or inorganic nuclei, under the drying influences of a shore-region and the rolling action of the waves. Oölitic limestones of ancient date are often associated with corals and marine shells, but the aragonite has passed into calcite. Oölitic structure often occurs in ironstones from a form of concretionary deposition. What is known as the *Oölite* or *Oölitic series* of rocks in geology consists of a series of strata comprehending a number of oolitic limestones, calcareous sandstones, marls, &c., which underlie the Cretaceous strata and rest on the Lias. See *Jurassic*.

Oömycetes, one of the main subdivisions of the Phycomycetes or Lower Fungi, characterized by the possession of distinct male (antheridia) and female (oögonia) sexual organs. See *Zygomycetes*.

Oöspore, in botany, the name given to the ovum after it has been fertilized by the male gamete; the zygote of an oögamous plant.

Oost (ōst), Jacob van, the Elder, one of the best Flemish painters, born at Bruges in 1600, died 1671. He proceeded to Rome, where he became the pupil chiefly of Annibale Caracci. In his youth he was so successful a copyist of Rubens and Vandyck that his copies still deceive connoisseurs.

Oost, Jacob van, the Younger, son of the preceding, born in 1637, studied at Paris and Rome, lived about forty years at Lille, and died at Bruges in 1713. His style is more marked, and his pencil is freer than that of his father.

Oosterhout (ō'stėr-hout), a town of Holland, in the province of North Brabant, 5 miles north-east of Breda. It has potteries, breweries, tanneries, corn-mills, beet-sugar factory, and some trade in grain, cloth, and timber. Pop. 12,000.

Ootacamund, or **Utakamand**, a sanitary station of Madras Presidency, India, and the summer head-quarters of the Madras Government, situated in the Nilghiri Hills on a branch line from Podanur. It is 7228 feet above sea-level, and lies in an amphitheatre surrounded by hills overlooking an artificial lake nearly 1½ miles long. There are churches, hotels, schools, hospitals, public library, botanic gardens, &c. The mean temperature is about 58° F. Pop. 18,000.

Oo'trum, a soft, white, silky, and strong Indian fibre, derived from the stem of *Dæmia extensa*, a plant of the nat. ord. Asclepiadaceæ, abundant in many parts of India.

Ooze, a white unctuous mud, consisting almost entirely of carbonate of lime, and occurring at a depth sometimes of 2500 fathoms, on the bed of the Atlantic and Pacific Oceans, where material from the shore-zones cannot mingle with the truly oceanic types of deposit. It is formed chiefly by the accumulation of the dead shells (tests) of foraminifera, commonly mingled, of course, with the remains of other marine creatures. The deposit bears an interesting resemblance to the beds familiar to the geologist as chalk, this formation also being made up largely of foraminiferal shells, and the most prominent genus, Globigerina, being especially characteristic of both.

Opah, or **King-fish**, a large and beautiful sea-fish (*Lampris luna*), constituting a distinct family (Lamprididæ) related to the stickle-backs. It is a native of the Eastern seas, but found in the Atlantic and Arctic Oceans, and sometimes, though more rarely, on the British coasts. It is about 4½ feet long and weighs 140 to 150 lb. Its colours are very rich, the upper part of the back and sides being green, reflecting both purple and gold, and passing into yellowish-green below, the fins bright vermilion. The flesh is highly esteemed.

Opal, a mineral commonly milky-white by reflected light; its iridescent varieties come under the class of pellucid gems. It consists of uncrystallized silica with about 10 per cent of water, and is very brittle. The iridescence of the varieties used as gems is due to layers of various refractive powers. The gem-varieties are found in many parts of Europe, especially in Hungary, in Mexico, Queensland, the East Indies, &c.

The substances in which it is most frequently found are rhyolite and a ferruginous sandstone. In the course of geological time it passes into chalcedony, by crystallization and yielding up its absorbed water. There are many varieties or species, the chief of which are: (*a*) *precious* or *noble opal*, which exhibits brilliant and changeable reflections of green, blue, yellow, and red; (*b*) *fire opal*, which simply affords a red reflection; (*c*) *common opal*, whose colours are white, green, yellow, and red, but without the play of colours; (*d*) *semi-opal*, the varieties of which are more opaque than common opal; (*e*) *hydrophane*, which assumes a transparency only when thrown into water; (*f*) *hyalite*, which occurs in small transparent colourless globular and botryoidal forms, with a vitreous lustre; (*g*) *menilite*, which occurs in irregular or reniform masses, and is opaque or slightly translucent. Formerly the opal was believed to possess magical virtues; thus it was held to confer invisibility when wrapped in a bay-leaf.

Open - bill (*Anastŏmus lamelligĕrus*), an African bird of the stork family, so named from the odd formation of the beak, which at the anterior end exhibits a gap between the mandibles as if part of them were worn away though they meet at the points. The chief food is molluscs, and perhaps this formation of bill has something to do with the opening of the shells. Another species (*A. oscitans*) inhabits India and Indo-China.

Openhearth Process. See *Steel.*

Opera. Opera may be defined as drama set to music and performed upon a stage, and the history of opera is the story of man's attempts to bring drama and music into an ever closer union. During the closing years of the sixteenth century the advanced musical spirits had been growing more and more discontented with the limited range of expression offered by the contemporary music. This was ideally suited to the utterance of religious emotions, but from its very nature was quite unable to take on any dramatic significance. So strongly was the need for a wider musical expression felt that attempts had been made to write dramatic music on the contrapuntal model, but the results were not distinguishable from the music of the Church excepting as regards the text alone. An example of this is offered by *L'Amfiparnasso*, a so-called comic drama which was produced at Modena in 1594. It contained five characters, and the music, of which there was a plentiful supply, consisted of a series of madrigals in five parts written inevitably in purely contrapuntal style and sung unaccompanied. There was therefore no orchestra and no overture; all five voices were always singing, and when the drama required that only one or two of the characters should be on the stage, the remainder of the little company continued singing from the 'wings', as is conclusively proved from woodcuts contained in the published score of the work.

The growing discontent with things musical would seem to have focused itself in a little band of Florentines—aristocrats, men of letters, and musicians, all glowing with the spirit of the Renaissance. They met in the house of one of their number with the avowed intention of reviving musical declamation as it was practised in the early Greek tragedies. For various reasons, some of them technical, this was not possible, but in their endeavour after it this band of pioneers lighted on the idea of solo-song, and in doing so accomplished, no doubt unwittingly, one of the most sweeping revolutions in the history of art. Among the musicians of this little company (there were three in all) was one Vincenzio Galilei, father of the astronomer, and a musician trained in the contrapuntal school. His orthodox musical upbringing, however, did not in any way damp his pioneer zeal, and he was the first to compose music for a solo voice to a secular text and with accompaniment for a single instrument. These early works were called cantatas, and the development from this simple but all-important essay in the writing of dramatic music to the composing of the first opera was rapid and direct. In 1597 Jacopo Peri, another musician of the company, set music to *Dafne*, a play written by a poet member, and the work was privately performed in Florence at the palace of one of the noble members. So much success attended this production that Peri was asked in 1600 to write something similar for production as a part of some high wedding festivities. He did so, and the result was *Eurydice*, the first real Italian opera to be given in public, and the ultimate ancestor of all operas. It is significant of the strong desire that existed for the development of music on dramatic lines that this first opera achieved a remarkable success and brought European fame to its composer. In a preface to his opera Peri says that in studying the drama of the ancients he felt convinced that they had adopted a tone of expression other than every-day speech, which though never rising into song was nevertheless musically coloured. This induced him to observe carefully the various manners of speaking in daily life, and these he endeavoured to reproduce in music as faithfully as he could. He was thus probably the first man to write *recitative*.

The progress which opera made in its early years was remarkably rapid, and it would seem as if the whole musical world had been waiting for it. Florence was its birth-place, but it spread quickly to the other important towns of Italy, Mantua being the first of them to have opera. In 1607, only seven years after the production of Peri's *Eurydice* in Florence, Monteverdi, the first great name in the history of opera, a man of undoubted genius and a musical pioneer, produced a work called *Arianna*, which was so successful that the reigning duke at once commanded a second opera, which appeared in the following year. It was on the same subject as Peri's work, but while Peri had been satisfied with a very moderate orchestra consisting only of one harpsichord (fore-runner of our pianoforte), three instruments of the lute family, and three flutes, or seven instruments in all, Monteverdi, writing only eight years later, had increased the orchestra to thirty-three, and had introduced stringed instruments and wind instruments.

In the earliest years we read of the enormous expense which attached to the mounting and producing of operas, and it was only reigning princes who could afford the luxury, and then only on occasions of great public rejoicing. To Venice belongs the honour of opening the first public opera-house, and thus transferring opera from the exclusive patronage of the nobility to the wider and more vivifying patronage of the people. This was in 1637. By the close of the century there were eleven opera-houses in Venice alone. The other Italian cities showed operatic activities in varying degree, but for long Florence and Venice were the two great nurseries of the new art.

Opera, which had originated in Italy as, to some extent, a derivative of the classical drama, was quickly taken up in other European countries, but in the lands of its adoption took on distinctive national qualities. French opera was directly derived from the ballet, which had always been a favourite form of entertainment with the French kings. The chief glory of its early years was G. B. Lulli, an Italian who spent his life in Paris. In England opera was the direct outcome of the masque, and Henry Purcell its greatest exponent. As a young lad he may have heard Milton's *Comus* performed, with music by Henry Lawes, and would no doubt be inspired by it to try his pen on really dramatic music, which that of Henry Lawes was not. However that may be, he wrote at the age of seventeen an opera on the subject of *Dido and Æneas* which may be regarded as the first English opera. It is a work with lasting powers of appeal, and has been produced in London in recent times. Its distinctive characteristics are the rhetorical perfection of its recitatives and the natural beauty of its melodies. Germany's first operas were imported direct from Italy and were sung in Italian. They did not appear till about fifty years after their beginning in Italy, so that the country which was destined to go farthest in opera was very slow in taking it up. Not till 1681 did a really German work meet with any success. In that year a *singspiel* called *Adam and Eve* was publicly performed in Hamburg in the German language, and its first performance marked the beginning of German opera.

The high aims which distinguished the Florentine pioneers were unfortunately lacking in the operatic outlook of some of their followers, and Italian opera for a time sank to a very low level of artistic merit. Up to about the year 1850 its history might roughly be divided into three stages, in which the dramatist, the composer, and, finally, the vocalist held sway. Verdi, the greatest opera-composer that Italy has produced, provided in his life-work examples of the conventional style in his early operas, but with ripening experience had the rare faculty of outgrowing his early methods, and gave to the world in *Aida*, *Othello*, and *Falstaff* works of remarkable power and beauty, written in the modern idiom. He is perhaps the most striking instance of the powerful and universal influence exerted in the operatic world by Richard Wagner, who may be called the latest of the operatic reformers. He had been preceded in this rôle by Gluck and Weber, the former of whom, in his later works, had abandoned the conventionalities and aimed solely at truth of dramatic expression, with such success that his *Orfeo, Alceste*, &c., are still among the most beautiful numbers of the operatic repertoire. Weber was the chief among the pioneers of the Romantic opera, his best-known work being *Der Freischütz*, unfortunately only familiar to the public of this country by its overture. Wagner, profiting by the labours of both Gluck and Weber, and adding still more of his own, has taken his place as the greatest of all opera composers. His method of composition, in which the orchestral score is compounded of *leitmotive* or representative themes, has been now universally adopted for dramatic writing, and the possibilities of interest which are inherent in such a system of, so to speak, running orchestral commentary are not likely soon to be exhausted.—Bibliography: Grove's *Dictionary of Music and Musicians*, article *Opera* (vol. iii); E. Markham Lee, *The Story of Opera*; A. Elson, *A Critical History of Opera* (giving an account of the rise and progress of the different schools, with a description of the master-works in each); W. J. Henderson, *Some Forerunners of Italian Opera*; H. E. Krehbiel, *A Book of Operas: their Histories, Plots, and Music*.

Oper'culum, literally a lid or cover, and specifically applied to a horny or shelly plate developed in certain univalve Mollusca upon the hinder part of the foot, and serving to close the aperture of the shell when the animal is retracted within it. It is also applied to part of the gill-cover of fishes; and to a sort of stopper with which some tube-making annelids (Serpulidæ) close the entrance to their dwellings.

Ophicleide (of'i-klīd), a brass wind-instrument of music invented to supersede the serpent, and now superseded by the euphonium. It generally consists of a wide conical tube, terminating in a bell like that of a horn, with a mouthpiece and ten holes or ventages which are stopped by keys. Ophicleides are of two kinds, the bass and the alto; the former has a compass of three octaves and one note, ranging from B on the third space below the bass-staff to C on the third space of the treble-staff, including all the intermediate semitones. The alto ophicleide (an inferior instrument) has the same extent of compass, but starts an octave higher.

Ophioceph'alus, a genus of tropical fresh-water fishes, native to Africa and Asia, allied to the climbing perch, and like it able to live a long time out of water.

Ophioglossaceæ, a family of Eusporangiate Ferns, comprising small perennial herbs or epiphytes, with creeping stems and leaves which are usually simple in Ophioglossum (adder's tongue) and pinnately branched in Botrychium (moonwort), and in both have a special fertile lobe on the upper side bearing numerous sporangia. The prothalli are colourless subterranean tubers living saprophytically by means of mycorhiza.

O'phir, a region to which the ships of Solomon and of Hiram, King of Tyre, made voyages, bringing back gold, almug-wood, and precious stones. Some identify it with the Ophir mentioned in *Gen.* x, 29, which was apparently situated in Arabia; while others place it in India, or in Africa.

Oph'ite, green porphyry or serpentine, an altered igneous rock of a dusky-green colour of different shades, sprinkled with spots of a lighter green. It is coloured by chlorite or serpentine. Called also *Ophiolite*.

Oph'ites, a Gnostic sect of the second century, so called because they held that the serpent by which Eve was tempted was sacred. Like most Gnostics, they advocated the emancipation of man from the control of the demiurgos. The serpent, therefore, who had tempted Eve and introduced an element of revolt against the demiurgos, was, according to their belief, a benefactor of humanity. The sect existed as late as the sixth century.

Ophiuchus (of-i-ŏ'kus), the Serpent-bearer, called also *Serpentarius*; one of the ancient northern constellations, representing a man holding a serpent, which is twined about him. The moderns, however, make a separate constellation of the Serpent.

Ophiuroi'dea, a class of the Echinodermata, comprising star-fishes known as brittle-stars and sand-stars. These animals have long, slender-jointed arms, which may either be branched or simple. Creeping is effected by a wriggling movement of the arms.

Ophthalmia, or **Conjunctivitis**, is inflammation of the conjunctiva of the eye, and all the forms are marked by redness and swelling of the white part of the eye, varying according to the severity of the infection, and by a muco-purulent discharge which glues the edges of the eyelids together at night. The patient complains of considerable irritation and itching, and of a sensation of sand in the eyes, but there is no pain or intolerance to light in ordinary uncomplicated conjunctivitis. The condition may be acute or chronic, and commonest types of the acute form are catarrhal; purulent, which is an extremely dangerous and contagious type; membranous, which is diphtheria affecting the eye; and phlyctenular.

In chronic conjunctivitis the signs and symptoms are similar, but less severe, and the condition may last for a long time. Granular conjunctivitis, or trachoma, is a type which has appeared in this country with the increased number of aliens, especially Russian Jews. It is a sub-acute condition and very persistent, and is characterized by the appearance of gelatinous granulations, like sago grains, scattered over the conjunctiva. Since the introduction of careful supervision of the eyes of aliens at the port of arrival the spread of trachoma has been considerably lessened.

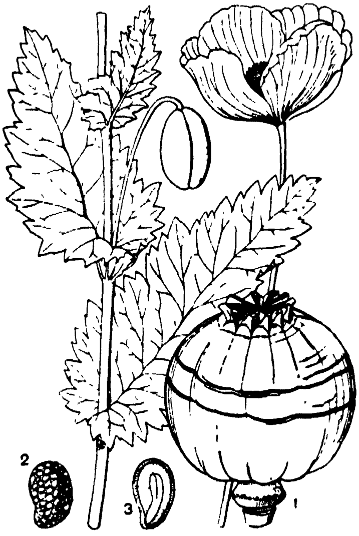
Ophthalmoscope is an instrument for observing the internal structure of the eye. It consists of a mirror by which light, from an artificial source, is directed into the eye of the patient, and a double-convex lens, by which the illumined parts of the structure of the eye are magnified. The observer looks through a hole in the centre of the mirror with the light to the side of, and slightly behind, the patient's head.

Opie, John, English painter, the son of a carpenter, born in the village of St. Agnes, near Truro, Cornwall, 1761, died 1807. His talent was accidentally discovered by Dr. Wolcot (Peter Pindar), who took the boy to London. When his portrait-painting ceased to be fashionable, he devoted himself to historical and Scriptural subjects with such success that he became a Royal Academician in 1788, and was elected professor of painting to the Royal Academy in 1805. He was the author of a biography of Sir Joshua Reynolds in Pilkington's *Dictionary of Painters*, and his four lectures on painting, with a memoir, were published by his wife, Amelia Opie (1769–1853), who acquired considerable fame as a writer of tales and poetry. Opie is well represented in the National Gallery and in the National Portrait Gallery. His remains were interred in

St. Paul's Cathedral near those of Sir Joshua Reynolds.

Opitz, or **Opitius**, Martin, German poet, born 1597, died 1639. He studied at Frankfort-on-the-Oder and at Heidelberg, visited Holland, and became professor of philosophy and classical literature at the University of Weissenburg (now Karlstadt). In 1625 he went to Vienna, where the Emperor Ferdinand II bestowed on him the poet-laureateship and letters of nobility, when he assumed the title of von Boberfeld. Opitz was well acquainted with classical literature, and the German language is indebted to him for new forms, greater smoothness, correctness, and euphony.

Opium, the inspissated juice of a species of poppy (*Papăver somnifĕrum*), cultivated on a large scale principally in Hindustan and in Asiatic Turkey, but well known in many places as a garden plant, being an annual with white, red, or violet flowers and glaucous leaves. The opium is the juice that flows from incisions made in the green heads or seed-capsules of the plant after the fall or removal of the petals, and the best flows from the first incision. The juice is at first a milky liquid, but soon solidifies and turns black, and is then scraped off and collected. It is one of the most energetic of narcotics, and at the same time one of the most precious of all medicines, and is employed in a great variety of cases, but most commonly for the purpose of procuring sleep and relief from pain. In medicine it is very commonly used in the form of *laudanum*, which is a simple tincture or extract in spirits of wine; it is also an ingredient in various patent and other remedies. Another opium preparation is *morphine* (q.v.). In its natural state opium is heavy, of a dense texture, of a brownish-yellow colour, not perfectly dry, but easily receiving an impression from the finger; it has a faint smell, and its taste is bitter and acrid. The principal part of our supply of opium is brought from Turkey, whence it is imported in flat pieces or cakes, covered with leaves. In the case of many temperaments opium produces such agreeable effects, whether a delightful dreamy calm, a state of pleasant exhilaration, or beatific visions, that numbers of persons are led to use it habitually, as others use alcohol in some form, though over-indulgence in it is attended with at least as evil effects as over-indulgence in the latter. But like tobacco it is taken by vast numbers without any apparent result one way or other. Some habitual takers of opium can take as much in a day as would kill ten or twenty persons unaccustomed to it. It is taken in two ways, known as opium-eating and opium-smoking. The habitual use of opium is most common in China, the south-east of Asia, and the Malay Archipelago, where it is chiefly smoked in a special pipe. The pipe, or rather the stem of the pipe, is about the length and size of an ordinary flute; the bowl is generally made of earthenware. The smoker, who is always lying, or at least reclining, takes a small portion of opium about the size of a pea on the end of a spoon-headed needle, heats it at a lamp, and then places it in the bowl of the pipe, the pellet of opium having previously been perforated with the needle. He then brings the opium to the flame of the lamp, inhales the smoke in several inspirations, and is then ready to repeat the process with a fresh quantity of opium until the desired intoxication ensues. Large quantities of opium used to be consumed in China, a great part of which came from India, though much was produced in China itself. The use of opium in China was put down between 1906 and 1916. In 1917 the importation of Indian opium into China ceased.



Opium Poppy (*Papăver somnifĕrum*)

1, Capsule showing Turkish method of incision. 2, Seed. 3, Section of seed.

Opland, an inland *fylke* (county) of Norway. It is mountainous and possesses innumerable lakes, and the south-eastern portion lies in the valley of Lake Mjösen. The railway from Christiania traverses the *fylke* to Fagernas, and via Lillehammer to Fokstuen and the Gudbrandsdal valley. Area, 9746 sq. miles; pop. (1920), 130,894.

Opon, a town of the Philippines, on Mactan Island, Cebú, opposite Cebú City. Maguey cultivation is the staple industry. Magellan was killed at Opon in 1521. Pop. about 23,000.

Opop′onax, the inspissated juice of an umbelliferous plant (*Opoponax Chironium*), a fetid gum-resin imported from Turkey, and now and again used as an antispasmodic in nervous complaints. There is a compound perfume which also receives this name.

Opor′to (ancient **Portus Cale** or **Gala**; Rom. *Castrum Novum*; Port. *O Porto*, the port), a city and seaport of Portugal, the second largest in the republic, capital of the province of Entre Douro e Minho, on the Douro, about 2 miles from its mouth, and along which it extends for 2 miles. The river is crossed by two bridges, one of them the railway bridge, and the other carrying two roadways. Among the chief buildings are the granite cathedral on the site of an ancient castle of the Suevi; the church of S. Francisco (built 1404); the bishop's palace, an enormous building; and the Torre dos Clerigos (Tower of the Clergy), a granite tower 210 feet high. The principal trade is in wine, white and red, but chiefly the latter (*port* wine, so named from this town), which is principally exported to Britain through Leixões, the port of the city. There are some manufactories of hats, silks, cotton, woollen, and linen stuffs, pottery, lace, glass, leather, and paper. Pop. 194,000.

Oporto, with its opposite suburb of Cale, gave its name to Portugal (i.e. Portus Cale), and existed as a trading-town before the Roman conquest. The Alani founded *Castrum Novum* on the north bank. During the Moorish occupation it was razed to the ground by Almansor of Cordova in A.D. 820, but was rebuilt and repeopled by Gascons and French as *Portus Gallorum* (999), a name from which some authorities derive the word Portugal. "Leal e invicta cidade" (the loyal and unconquered city) is the official title of Oporto. The great event in the history of Oporto was the siege of 1832 and 1833, when Dom Pedro IV landed at Arnosa on 8th July, 1832, and was shut up in Oporto with 7000 men. The town was besieged by Dom Miguel. Wellington effected the passage of the Douro on 11th May, 1809, and forced the French under Soult to beat a precipitate retreat from Oporto.

Opos′sum, the name of several species of well-known American marsupial mammals, usually possessing a long prehensile tail. The type-genus is Didelphys. They are nocturnal and, in most cases, arboreal in their habits, living constantly on trees, and there pursuing birds, insects, &c., although they do not despise fruit. The females of certain species have an abdominal pouch into which the teats project, and within which the young can be sheltered. The best-known species of opossum is the *Didelphys virginiana*, very common in the United States. It is almost the size of a large cat, the general colour whitish-grey, and the whole hair of a wool-like softness. On the ground the motions of the opossum are awkward and clumsy, but on the branches of a tree it moves with great celerity and ease, using the prehensile tail to assist its motions. When caught or threatened with danger the opossum counterfeits death, and 'playing 'possum' has on this account passed into a proverb as used to indicate any deceitful proceeding. The female has from ten to fifteen young, which are for a long time nourished in the pouch, to which they resort when alarmed. In pouchless species the young, when old enough to leave the teats, are carried on the back, and in some cases hold on by their prehensile tails to the forwardly bent tail of their mother. The water opossum or yapock (Chironectes), native to tropical America, lives in streams and feeds on fish and crustaceans. It has webbed hind-feet, and is about the size of a large rat.

Opossum-shrimp, the popular name of several species of Mysis, a genus of small crustaceans. They receive their name from the females carrying their eggs and young in a pouch between the thoracic legs.

Oppeln, a town of Silesia, on the Oder. It has an old royal castle, and the oldest church of Upper Silesia (St. Adalbert), founded A.D. 995. Pop. 34,000.

Oppenheim (-hīm), a town of Germany, in Hesse-Darmstadt, on the Rhine. It is of considerable historical importance; was taken by the Swedes (1631) and French (1689, 1792, and 1794). There is a trade in wine. Pop. 4000.

Oppian, the name of two Greek authors, one of whom wrote a poem entitled *Halieutica* (Fishing), and the other a poem on *Cynegetica* (Hunting). The author of the *Halieutica* flourished about A.D. 170. The author of the *Cynegetica* was born at Apamea or Pella, in Syria, and flourished about A.D. 210. There is also a prose paraphrase of a poem on bird-catching, attributed to Oppian; but it is doubtful to which of the two it belongs.

Opposition, in astronomy, the situation of two heavenly bodies when diametrically opposed to each other, or when their longitudes differ by 180°. The moon when in opposition to the sun appears as full moon; a planet in the same position is at its nearest and brightest, and on the meridian at midnight. See *Conjunction*.

Oppy, a village of France, in the department of Pas-de-Calais. It was the scene of severe fighting during the European War (battle of Arras) between April and May, 1917, and was a strong place on the Hindenburg line.

Optical Illusions. In early times devices operated by physical forces, the properties of which were little known by the ordinary people, were in use, not only in the shows of reputed wizards, but also as a necessary part of some forms of religious services. Hero describes, in his

Pneumatica, a small temple which opened its doors to allow the invisible god to come out among his people whenever an offering was burned on the altar. The operating mechanism was out of sight, and the motive power was the heat, which caused the expansion of the air in the hollow altar. When the offering cooled, the air contracted, the temple doors closed, and the period of religious exultation was over. Spectral pictures, reflections of moving objects, and 'visions' on smoke were sufficiently common in the fourteenth to sixteenth centuries to be referred to in the works of the authors of that period. In later times we find the same old tricks performed, but considerably improved by the use of appliances of much better construction. Boxes and cabinets provided with mirror-backed partitions, to give them the appearance of being empty, have been much used by Tobin, Pepper, Maskelyne, and other illusionists. Assistants were made to appear in and disappear from these boxes in the most remarkable way. In 1858 Henry Dircks introduced the use of an inclined sheet of plate-glass to the stock-in-trade of the stage illusionist. The actors performed, partly behind the glass and partly in a well below but in front of the stage, from which positions they produced reflections on the glass which could be observed by the audience. The formation of these reflections could be stopped at any instant to make the 'ghosts' disappear. The device was described by Dircks at the meeting of the British Association in 1858. John Henry Pepper joined Dircks in patenting and demonstrating the apparatus, which was always spoken of as 'Pepper's Ghost'.

Optical Lantern, or Magic Lantern, an apparatus which is capable of producing, on a screen, enlarged images of small suitable objects. The apparatus comprises a source of light enclosed within the lantern body, a condenser lens system, the object to be exhibited (such as a photograph in the form of a lantern slide, or a cinematograph film), an objective lens system, and the screen on which the image is formed. The condenser consists of two large plano-convex lenses placed with their plane surfaces outermost. The light collected by the condenser converges to pass into the objective; on its way it passes through the lantern slide situated immediately in front of the condenser in a frame called the slide stage. The objective consists of a converging system of lenses similar to a photographic objective; it is corrected for spherical and chromatic aberration, and is provided with a rack and pinion for varying the distance from the slide in order to focus the image on the screen. The screen is preferably a flat wall with a smooth white surface of plaster of Paris; a linen sheet forms a portable screen.

When electric current can be obtained from a public or private source, the illumination is generally done by means of an electric arc. The current is led through two carbon rods; it enters the upper or positive carbon, and, bridging the air-gap between the carbons, sets up an intensely luminous flame or arc. (See *Electric Light: Arc Light.*) With a 'direct current' supply, the upper carbon burns faster, and is therefore made thicker than the lower carbon. The carbon holder has a convenient mechanism for causing the ends of the rods to touch or separate, and for adjusting the position of the arc laterally or vertically. The arc is set up by applying the voltage to the carbons, which are first made to touch, then immediately separated to such a distance that the arc does not hiss. One effect of the arc is to form a crater at the end of the upper carbon; this crater is the most luminous part of the arc, and it is utilized by sloping the carbons backwards at an angle of about 30°. A rheostat or regulating resistance is included in the circuit for the purpose of adjusting the strength of the current. The voltage, which depends on that of the supply mains, may be from 50 to 500, but a low voltage is more economical as a pressure of 50 volts is all that is required to pass the requisite current through the arc. In a 'hand-feed' arc, the carbons are adjusted by hand from time to time as required.

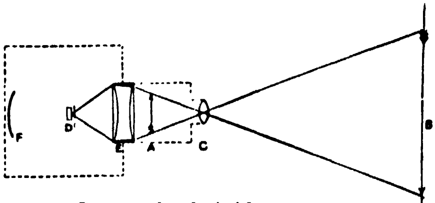


Diagram of an Optical Lantern

D, Lamp. E, Condenser. A, Slide. C, Objective. B, Screen. F, Reflector.

Lime light is produced by projecting against a cylinder of lime a very hot flame obtained by burning the gases oxygen and coal gas together. The lime is raised to a white heat, and becomes a source of great luminosity. The lime cylinder on its holder takes the place of the electric arc within the lantern body. The gases are carried in steel cylinders at a maximum pressure of 1800 lb. per square inch. The cylinders hold from 6 to 40 cubic feet of gas, and are provided with pressure gauges and pressure regulators, which ensure uniform pressure and enable the jets to be turned down or turned off at the lantern. The consumption of gas is about 3 cubic feet per hour. The gases are led by rubber tubing to a double jet which when lit plays on the lime cylinder. The coal gas may be taken direct from gas mains, or hydrogen gas may be used instead. Lime-light lanterns have been employed in theatres for illuminating purposes, and hence has arisen the use of the phrase 'in the lime light', but the more convenient electric illuminant has displaced this method of lighting to a great extent. The optical lantern is also employed to project images of opaque objects (episcopic projection). This is done by means of the light reflected from the object; the latter requires very strong illumination, and the rays from it are passed through the objective as in the previously described (diascopic) method. When combined with the microscope, the optical lantern forms a projection microscope which enables a number of spectators to see simultaneously a microscopic section or other small object. The lantern may also be adapted for exhibiting the working of various physical and chemical experiments in the lecture room. (See also *Cinematograph.*) — BIBLIOGRAPHY: Lewis Wright, *Optical Projection*; Colin N. Bennett and others, *Handbook of Kinematography*.

Optics, the science of light and vision. The subject is treated under such headings as *Light* and *Lens*, where other references are given. The present article contains some theoretical matter which may be usefully read in connection with *Lens*.

An *optical system* is a combination of lenses or mirrors or both, made for the purpose of obtaining images of objects. In a perfect optical system the first condition to be fulfilled is that every object point shall have one definite corresponding image point; or, in other words, that a system of rays diverging from, or converging to, a point before entering the system, shall diverge from, or converge to, another point after passing through the system. In actual combinations of lenses, this condition is sometimes satisfied to a high degree of approximation, but never rigorously. The process of image formation may be illustrated by the example of a single-biconvex lens of glass. Let the lens be bounded by two spherical surfaces, (1) with centre C and radius r, (2) with centre D and radius s. Let a ray starting from an object point U meet the surface (1) at P. According to the law of refraction (q.v.) the ray will be bent towards the normal PC, and if PK is the line which it takes in the glass, we shall have $\sin\alpha = \mu \sin\beta$, where μ is the index of refraction from air to glass. If CH is perpendicular to UP, CK to PK, and PN to UC, this gives $UC \sin\theta = \mu \cdot WC \sin\phi$, or $UC \cdot PN/UP = \mu \cdot WC \cdot PN/WP$, or $UC/UP = \mu \cdot WC/WP$. Let us now suppose that the pencil of rays of which UP is one is very thin, so that the angle PUC is not more than 2° or 3°. Then, very approximately, $UP = UE$, and $WP = WE$. We thus have $UC/UE = \mu \cdot WC/WE$. Let $UE = u$, $WE = w$; then $(u + r)/u = \mu(w + r)/w$, or $1/u - \mu/w = (\mu - 1)/r$ . . . (A). Every ray such as UP therefore very approximately passes after refraction through the point W in CU, given by (A). We have next to consider in the same way what happens to the pencil through W, after refraction at the surface (2). If the ray WP after refraction at (2) takes a line meeting WD at V, then, by the method already used, $VD/VG = \mu \cdot WD/WG$. If $VG = v$, $WG = w'$, this gives $\mu/w' - 1/v = (\mu - 1)/s$ . . . (B). A small pencil of rays through W therefore passes through V after refraction. Hence the original pencil through U becomes a pencil through V after passing through the lens.

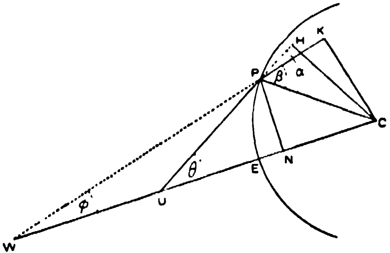


Fig. 1

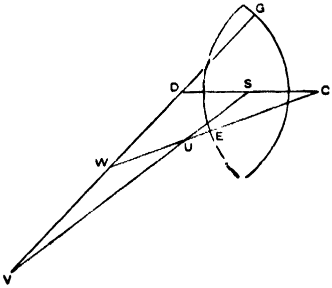


Fig. 2

If the lens is very small we may take $w' = w$. By adding (A) and (B) we then get

$$1/u - 1/v = (\mu - 1)(1/r + 1/s) \ldots (C)$$

Denote the reciprocal of the expression on the right of (C) by f; then $1/f = (\mu - 1)(1/r + 1/s)$ . . . (D), and $1/u - 1/v = 1/f$ . . . (E). We see from (E) that when v is infinite, $u = f$; hence rays proceeding from a point at distance f from the lens become parallel. Similarly when u is infinite $v = -f$; hence a parallel beam converges to a point at distance f on the other side of the lens; the *focal length* of the lens is therefore f as given by (D). *Any* ray through U passes through V after its two refractions. Take as a special case a ray in the line VU. After the refractions this ray continues to pass through V, and therefore proceeds, according to our approximation, on its original line. Now it can be shown by geometry that a ray, which after emergence from the lens continues in a line parallel to its original line, must pass through a centre of similitude of the two spherical surfaces, which here is a point dividing DC in the ratio of the radii. This point S is the *optical centre* of the lens; for a thin lens it is the point where the axis DC cuts the lens. Hence V is found when U is given from the two conditions that V is in the line US, and that VS ($= v$) and US ($= u$) are connected by the relation (E). These are the facts which are assumed for the construction of the diagrams in the article *Lens*.

Optimism, the antithesis of pessimism, is the tendency to look upon everything in the most favourable light. Emotional optimism, to be distinguished from philosophical or systematic optimism, is instinctive, and depends greatly upon temperament. A man is an optimist, and always inclined to look upon the hopeful, bright side of life, because he is organically so constituted, i.e. is born with an optimistic disposition. Such an emotional optimist is not free from a certain amount of egoism, as the fact of the endless suffering of numerous beings does not disturb his equanimity and happy disposition.

In philosophy, optimism is the doctrine which maintains that the universe, in spite of the apparent imperfections and the evil in it, is the best, and could not be otherwise than it is. In his *Théodicée* Leibnitz, referring to the objections of Bayle, endeavoured to show that among the possible worlds which presented themselves to His infinite intelligence, God has chosen and created the one which He considered to be the best. What appears imperfect in the world when considered by itself, is by no means so when considered with regard to the whole. If this world were not the best then either the omnipotence or the perfect benevolence of God would have to be denied. Leibnitz's theory was developed and even exaggerated by Pope in his famous *Essay on Man*, and severely criticized and ridiculed by Voltaire in his philosophical novel *Candide*.

Among ancient philosophers, Democritus was a decided optimist, Heraclitus a pessimist. Plato and Plotinus were optimists. The latter went so far as to maintain that prisons, wars, epidemics, and death were all very good and useful for humanity. Socrates, and to a certain extent Aristotle, were optimists. Among modern philosophers, Descartes, Spinoza, and above all Leibnitz, were optimists.—BIBLIOGRAPHY: Sir L. Stephen, *History of English Thought in the 18th Century*; Guttmacher, *Optimism and Pessimism in the Old and New Testaments*; J. Sully, *Pessimism*.

Optophone, an instrument the purpose of which is to enable the blind to read ordinary printed matter, such as books or newspapers. This is accomplished by producing in a telephone receiver series of musical notes forming what one may call musical motifs representing the various letters as these are passed over by the instrument in traversing a line of printing. The sense of hearing is thus used instead of the sense of sight.

The instrument is the invention of Dr. E. E. Fournier d'Albe, and has been developed by Messrs. Barr & Stroud, Limited, Glasgow. It depends for its action upon a very remarkable property of selenium, a chemical element (discovered in 1817 by the Swedish chemist Berzelius) which, in its grey crystalline form, varies greatly in electrical conductivity in accordance with the amount of light to which it is exposed, though the resistance is always high.

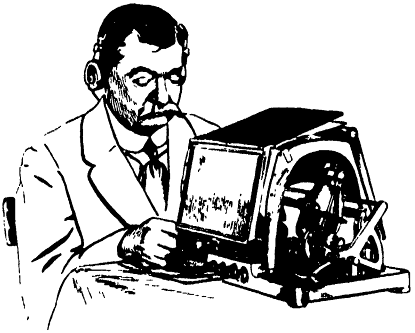


Fig. 1.—Optophone in use

The full effect of light on the conductivity of grey selenium is not attained instantaneously by any means. But, though it takes a comparatively long time (some minutes) for the light to produce its maximum effect, a measurable and useful variation in the conductivity takes place in periods of exposure and eclipse as short as $\frac{1}{1000}$th or even $\frac{1}{10000}$th of a second.

Instruments can therefore be constructed that can detect pulsations of light of periods corresponding to those of the vibrations in audible sounds. A properly prepared selenium bridge connected in series with a battery and a telephone receiver, and exposed to illumination and eclipse alternating some hundreds of times per second, causes corresponding pulsations of current through the telephone, and produces audible sound of corresponding pitch and quality.

If a bold pencil-line be drawn on the surface of a small tablet of unglazed porcelain, it will be found that the graphite (black lead) of the pencil-line is quite a good electric conductor; that is to say, when the terminals of an electric battery of a few cells are connected to the two ends of the pencil-line, a considerable current will flow through the thin film of graphite. Now, if a second pencil-line be drawn on the porcelain, say $\frac{1}{50}$th of an inch from the first line, and the terminals of the battery be connected one to each line, no appreciable current will flow —the bare porcelain of the gap forms a very perfect insulator between the conducting lines. If now a thin layer of melted selenium is smeared over the two lines and the intervening space, and if, by stoving for six hours at about 215° C., the selenium is converted from the vitreous into the grey crystalline state, it will be found that when the terminals of a battery are connected to the two pencil-lines respectively, a small current will flow across the selenium bridge, and the strength of the current will be found to be considerably greater when the selenium is subjected to light than it is when it is in darkness. If, then, a telephone receiver be connected in series with the battery and the selenium bridge, a current will pass through the telephone, and the current will vary as the lighting of the tablet is varied. When flashes of light are thrown on to the tablet at a rate of 270 per second, the current will rise and fall at that rate, and the telephone will sing out the note C (middle C of the piano). If the pulsations of the light be at half that frequency, i.e. 135 per second, the telephone will sing out C an octave lower, and with 540 pulsations per second the C one octave higher, and so on. The telephone can thus be made to sing any tune by the proper succession of sets of pulsations of light applied to the selenium. If, then, a selenium bridge can be exposed to a succession of pulsations of light corresponding in some way to the forms of letters as these are passed over in traversing a line of printing, each letter will be indicated by the telephone by a characteristic musical motif. This the mechanism of the optophone does.

In the optophone the printed page to be read is placed face downwards on a glass plate supported on a suitable stand (see figs. 1 and 2, general view and diagram). Beneath the plate is placed a tablet of porcelain pierced with an aperture to permit the passage of a small pencil of light upwards, and so through the glass on to the paper. The upper surface of the tablet, around the aperture, is prepared as a sensitive selenium bridge, and connected to a battery and a telephone. The bridge receives only light reflected from the page. The illumination of the bridge is thus much greater when the pulsating light falls on a white part of the page than it is when the light falls on a black part, i.e. on a portion of a letter.

The light used in the optophone is obtained from a small straight-filament electric lamp (an ordinary 'festoon' lamp). Through the intervention of a perforated disc kept in rapid rotation by a tiny magneto-electric motor, the light that falls on the printed matter forms five bright spots, forming what is called the 'scala'. Each spot is pulsating at a rate corresponding to the number of holes in the circle of perforations to which it belongs, multiplied by the number of revolutions per second of the disc. Thus, if there be 18 holes in the innermost circle, 24, 27, 30, and 36 in the other circles respectively, and the disc makes 540 divided by 24—about 22—revolutions per second, the second circle of holes will produce 540 pulsations of light—corresponding to the note C′. The numbers of holes given above are in proportion to the vibrations in the notes G, C′, D′, E′, G′ (soh, doh, ray, me, soh). A change in the speed of rotation of the disc of course alters the pitch of the notes, but the intervals remain unaltered. A faster or slower rotation of the disc than that supposed only alters the key. Too high or too low a pitch lessens the audibility of the note for a given intensity of light.

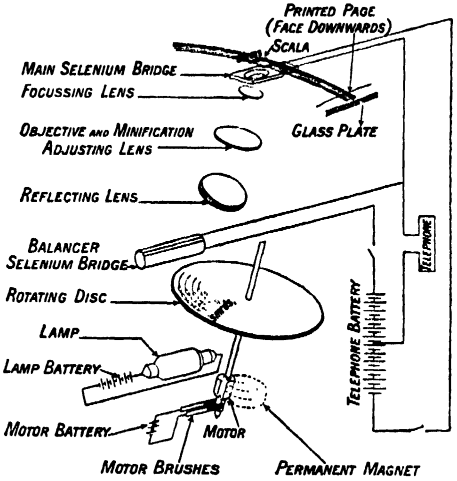


Fig. 2

Provision was made in the first optophone for moving the book over the selenium tablet by means of a hand-driven gear. In the present improved instruments, designed by Messrs. Barr & Stroud, Limited, the glass plate is curved, and a 'tracer' carrying the lamp, disc, and optical system is pivoted about the axis of the curve, and swings so that the spots of light travel along the line of printing at a speed which is adjustable according to proficiency, the book remaining stationary.

If all the spots of light fall on white paper—say the space between two words—all the notes will be sounded together in the telephone, producing a discord. Now if the scala passes over the letter V, the note G′ will first be silenced, then E′, D′, C′, G′ in succession (see fig. 3). It will be evident then that each letter will alter the succession of sounds in a different manner. The 'sound alphabet' so produced has to be learned. The arrangement described constitutes what may be called a 'white-sounding' optophone.

One of the improvements introduced by Messrs. Barr & Stroud is the modification of the instrument so as to make it 'black-sounding'. In this form white paper is represented by silence (more or less complete), and notes are sounded as the scala comes over black markings. With this form of optophone—other things being as described—the letter capital V is represented by the motif G′, E′, D′, C′, D′, E′, G′ (soh, me, ray, doh, ray, me, soh), sung more or less rapidly, according to the speed of reading for which the instrument is set. The letter A is represented by the same notes, but in ascending and then descending order, with the note E′ or D′ continuing to sound as the corresponding spot of light passes along the horizontal line. The letter small o is represented by the motif D′, $\frac{E'}{C'}$, D′, and so on.

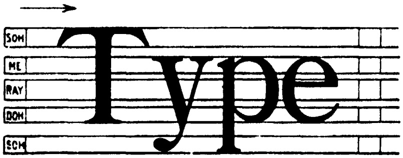


Fig. 3

An adjustable friction-gear has been devised for moving the tracer down the page, a line space at a time, or up the page one line space if desired for re-reading a line.

It is not to be supposed that optophone reading will consist in analysing the sound motifs so as to identify the *forms* of the letters indicated. That would be hopelessly slow. The motif for each letter will be recognized as a whole, and later in the reader's practice the more extended motifs for syllables and even words will become familiar to his ear. He will treat the motifs produced by the optophone as words in a new language, which he will translate into the spoken tongue as they are uttered.

One may expect that hand-writing—of less than copper-plate quality—will always be very difficult to decipher by the optophone, and may be left out of consideration, but the reading of type-written matter should be quite within the capacity of an optophone reader, and now that many sightless persons are expert typists, the optophone should greatly extend the fields of employment open to them.

There are, naturally, limitations in optophone reading, such as the impossibility of a blind person rapidly finding any desired page or paragraph in a book, or selecting the portions of a newspaper that may be of interest. But, apart from such obvious disabilities, the instrument should open up quite a new field of interest and instruction to the blind in enabling them to study books and magazines that are at present closed to them.

Opun'tia, a genus of plants of the Cactus order, having stems consisting of flat joints, broader above than below, but ultimately in process of growth losing this appearance. Their native country is South America. Many have handsome flowers, and some of them yield a pleasant subacid fruit. *O. Tuna* and *O. coccinellifera* are cultivated for the cochineal insect. *O. vulgaris* is the prickly-pear, and *O. Ficus indica* the Indian fig. See *Indian Fig*; *Prickly-pear.*

Orach, or **Orache** (or'ach), the popular name of several British plants of the genus Atriplex, ord. Chenopodiaceæ, plants with mealy foliage, generally growing near the sea. A cultivated species (*A. hortensis*) is known as garden or mountain spinach, being used like spinach.

Or'acles (Lat. *orare*, to pray), the places where the gods of the Greeks, Romans, and Egyptians gave responses to the inquiries of worshippers. The term was also applied to the answers themselves which the gods were supposed to give, by words uttered or otherwise, to those who consulted them upon any occasion. The credit of oracles was so great that vast numbers flocked to them for advice. Scarcely any war was waged, or peace concluded, or new form of government instituted, or new laws enacted, without the advice and approbation of some oracle. The Greek oracles were the most celebrated, the earliest being that of Zeus (Jupiter) at Dodona. Of the other gods Apollo had many oracles, but that at Delphi held the first place, and it was often applied to for explaining obscure answers obtained at Dodona. Another famous oracle of Apollo was in the Island of Delos. The Romans had no important oracles of their own, but had recourse to those of Greece and Egypt. The early Christians ascribed the oracles in general to the operation of the devil and his agents; but the practices of the priests, the manner and circumstances of delivering the oracles, the ambiguity of their answers, and the art of accommodating them to all events, amply demonstrate their human origin; yet they long maintained their standing, and sunk only with the freedom and independence of Greece. Under the reign of Theodosius the temples of the prophetic deities were shut up or demolished.—BIBLIOGRAPHY: Bouché-Leclercq, *Histoire de la divination dans l'antiquité*, F. W. H. Myers, *Essays Classical* (Greek Oracles).

Oran (Ar. *Wahran*, a ravine), a fortified seaport and French naval torpedo-station, the second city of Algeria, on the Gulf of Oran; capital of the department of Oran, and served by railway (250 miles) from Algiers. Esparto grass, wine, cattle, cereals, hides, and minerals are exported. Oran was built by the Moors, taken by Spain (1509), and held by them until 1792. France took possession in 1830. Pop. about 124,000.

Oran, a maritime department of Algeria, on the Mediterranean; area, 23,500 sq. miles; pop. (estimated), 1,230,190.

Orang′, or **Orang-utan** (*Simia satÿrus*), one of the anthropoid or man-like apes or monkeys. This animal seems to be largely confined to Borneo and Sumatra. It is one of those animals which approach most nearly to man, being in this respect only inferior to the chimpanzee and gorilla. It is utterly incapable of walking in a perfectly erect posture. Its body is covered with coarse hair of a brownish-red colour; in some places on its back it is 6 inches long, and on its arms 5 inches. The face is destitute of hair save at the sides. It attains the height of from 4 to 5 feet, measured in a straight line from the vertex to the heel. The arms reach to the ankle-joint. The hind-legs are short and stunted, the nails of the fingers and toes flattened. They swing themselves along from tree to tree by the aid of their long arms, but their gait on the ground is awkward and unsteady. At birth the head of the orang resembles that of the young child. These apes are remarkable for strength and intelligence, and capable of being highly domesticated if captured young. They feed chiefly on fruits and sleep on trees. See *Man*; *Apes*; *Monkeys*.

Orang-utans (*Simia satÿrus*)

Orange Blossom and Foliage

Orange, the fruit of the *Citrus Aurantium*, and the shrub or tree itself, nat. ord. Rutaceæ. The orange is indigenous in China, India, and other Asiatic countries, and was first introduced into Portugal about 1520. It is now extensively cultivated in Southern Europe. In Portugal and Spain the fruit forms an important article of commerce. Large quantities are also produced in the Azores, in Africa, America (especially in Florida), and the West Indies, in Australia and the Pacific Islands. The tree is a middle-sized evergreen, with a greenish-brown bark. The leaves are ovate, acute, pointed, and at the base of the petiole are winged. The white flower exhibits a calyx with five divisions, a corolla with five imbricate petals, stamens equal in number to the petals or a multiple of them, and along with the petals inserted on a hypogynous disc, the filaments being united in several bundles. The fruit is globose, bright-yellow, and contains a pulp which consists of a collection of oblong vesicles filled with a sugary and refreshing juice;

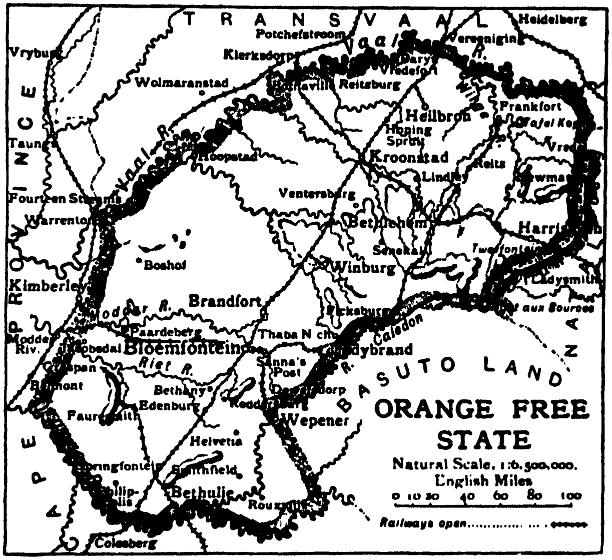
it is divided into eight or ten compartments, each usually containing several seeds. The principal varieties are the common sweet or China orange, the bitter or Seville, the Maltese or red-pulped, the Tangerine, the Mandarin or clove, and the St. Michael's. The leaves, flowers, and rind yield fragrant oils much used in perfumery and for flavouring essences. The wood is fine-grained, compact, susceptible of a high polish, and is employed in the arts. The citron and lemon are allied fruits.

Orange (ancient **Arausio**), a town of South-Eastern France, in the department of Vaucluse, and on the Meyne; served by the Paris - Lyon - Mediterranean line from Lyons to Marseilles. It is celebrated for its Roman remains, including a triumphal arch erected in honour of Tiberius, and a theatre of the period of Hadrian, restored in 1894. Arausio was the capital of the Cavari, and here the Cimbri and Teutones defeated a Roman army in 105 B.C. In the eleventh century it became the capital of a countship, and passed as the Principality of Orange to the House of Nassau (sixteenth century), giving name to the Orange family who were subsequently rulers of the Netherlands and of England. By the death of William III the principality passed to France, through Prussia (Treaty of Utrecht, 1713). Pop. 11,080.

Orange, a city of New Jersey, United States, in Essex county, a terminal station of the Orange branch of the Erie Railroad, and served also by a branch of the Delaware, Lackawanna, & Western Railroad, and by electric lines to South Orange and Newark. It is within easy distance (14 miles west) of New York City, and contains the mansions of many business men. The local hats are celebrated. Orange was settled in 1670, and became a city in 1872. Pop. (1920), 33,240.—*East Orange* is a residential city formed from part of Orange in 1863. It became a city in 1899. Pop. 54,000.—*West Orange* is 12 miles from New York on the Erie Railroad, and is also a residential town formed from Orange proper in 1862. Thomas Alva Edison's laboratories are at West Orange. Pop. about 16,000.

Orange-bird (*Spindalis nigricephala*), a Jamaican bird, one of the tanagers, so called from its orange-coloured breast.

Orange Free State, an inland province of the Union of South Africa, lying between the Vaal and Orange Rivers, and, like the Transvaal, forming a part of the South African Plateau. It is a great grass-covered plain traversed by stark rivers and hills of dolerite or ironstone. The rivers are tributaries of the Vaal for the most part, and they run in a north-westerly direction. From the north they are the Klip, Wilge, Rhenoster, Valsh, Zand or Vet, Modder, Riet, and the Orange itself, from Aliwal North. Parallel to the watershed there is the Caledon, and on the north-west there is the Vaal, parallel to the Caledon. Bloemfontein is the capital (pop. 1918, 15,681).



Social Conditions.—The climate is healthy. The Dutch Reformed Church is the predominant religious body, and an equivalent number of coloured persons have no religion. Lower and secondary education is controlled by the Province, higher instruction by the Union. Fees are charged at all schools, and except where parents object instruction is bilingual (English and Dutch). There are secondary schools in all towns, and a Normal College and a Polytechnic College in addition.

Production.—A great rolling plain with an annual rainfall of 22 inches, the Orange Free State is suitable for dry farming, and large areas are covered with mealie fields and (in the Basuto borderland) with wheat. Terrible droughts occur, when the entire country is denuded of vegetation.

The main industry is stock-raising, cattle and horses doing well, and sheep fairly in the flats towards the Orange River.

The mineral wealth of the province consists mainly of diamonds; these are either in 'dry diggings' (i.e. mines working volcanic pipes, such as Jagersfontein and Koffeefontein) or 'river diggings' (i.e. alluvial claims along the Vaal River, chiefly round Christiana in the Boshof country). The coal area lies north of Kroonstad.

Currency, &c.—The coinage is British, as are the weights and measures; the land measure is the Morgen, equal to $2\frac{1}{10}$ acres approximately.

Area, &c.—The area is 50,389 sq. miles, divided into 24 districts. Pop. (1911), 528,174 (about 180,000 are white, 1918).

See *South Africa*; *Boers*; *Transvaal*; *De Wet*.

BIBLIOGRAPHY: A. H. Keene, *Africa* (vol. ii); Chr. de Wet, *Three Years' War (1899–1902)*.

Orange-lily (*Lilium bulbiferum*), a species of lily having a scaly bulb, a leafy stem 2½ feet high, small dark-brown bulbs in the axils of the leaves, and large orange-coloured flowers.

Orangemen, members of the Orange Institution. This Institution is composed of Protestants, united and resolved to the utmost of their power to support and defend the rightful sovereign, the Protestant religion, the laws of the Realm, the Legislative Union, and the succession to the throne in the House of Windsor being Protestant; and united further for the defence of their own persons and properties, and the maintenance of the public peace. It is exclusively an association of those who are attached to the religion of the Reformation, and will not admit into its Brotherhood persons whom an intolerant spirit leads to persecute, injure, or upbraid any man on account of his religious opinions. Orangemen associate also in honour of King William III, Prince of Orange, whose name they bear as supporters of his glorious memory. The Orange Institution was formed on the evening of the day on which the battle of the Diamond was fought, 21st Sept., 1795. It grew rapidly, and has continued to grow steadily. Its home was in Ulster, and it has always been strongest there in proportion to the number of inhabitants, but it has spread all over Great Britain and the colonies, being especially active in Canada. Mr. Asquith's proposals for Home Rule had the effect of greatly increasing the membership of the order, which now admits women. The Orange Institution is organized upon a basis somewhat similar to that of freemasonry. Every member must belong to a private lodge, which must meet once a month. Higher branches of the organization are the District Lodge, meeting once a quarter; the County Grand Lodge, meeting twice a year; the Grand Lodge of Ireland, meeting twice a year; and the Imperial Grand Lodge. Candidates for admission to the order must be over eighteen years of age, must be loyal to the king, must be Protestants and, if married, married to Protestant wives, and must promise to defend the Constitution, support the civil power, and be faithful to other Orangemen. Six months after his admission (twelve months after his admission if he be under twenty years of age) an Orangeman may be admitted to the higher degree of Purple. The Institution of Royal Black Knights of Ireland forms in effect a higher branch of the Orange Institution, though the two organizations are independent of one another and controlled by totally different officials. Every candidate for admission as a Black Knight must be a Purpleman of at least six months' standing. There are twelve degrees in the Black order, the highest of them all being that of Red Cross. Black Knights sit in Preceptories, not Lodges, and their secretary is called a Registrar. Every Orangeman is bound to wear regalia when sitting in his Lodge, and when attending an Orange procession or the funeral of a brother Orangeman. It is customary to wear a collar when in the Lodge, and a sash on other occasions. The anniversaries kept by the Institution are the 5th Nov., the day both of the Gunpowder Plot and of the landing of William III at Torbay, and the 12th July. The 12th July is actually the anniversary of the battle of Aughrim, but, by a confusion between the old and new styles, it is sometimes regarded as the anniversary of the battle of the Boyne, which was fought on 1st July, old style.

The Orange Institution is a secret organization only in so far as it has signs and passwords by which members can be distinguished from non-members. Its real object is an open secret. It binds together men who are loyal and religious, and sets its face against sedition and irreligion, in whatever quarters they may be found. The Institution has from the outset been much calumniated, not only by those who were themselves seditious, but also by those who believed in getting rid of sedition by granting everything it demanded. The Institution was originally formed to protect life and property, and would never have been necessary had the Government of the day performed its duty of governing. Two years after its foundation the Institution defended itself ably against the charges brought against it, and as the accusations have always been the same, this defence is still of interest. "We have with the greatest pleasure", they said, "seen declarations of loyalty from many congregations of our Roman Catholic brethren, in the sincerity of which we declare our firm confidence, and assure them, in the face of the whole world, and of the Being we both worship, though under different religious forms, that, however the common enemies of all loyal men may misrepresent the Orangemen, we consider every loyal subject as our brother and our friend, let his religious profession be what it may. We associate to suppress rebellion and treason, not any mode of worship. We have no enmity but to the enemies of our country." George Borrow, who was, in his own words, "not only an Englishman but an East Englishman", and who was not unduly biased, has given a fine description of the type of men that the early Orangemen were. "They were sent as colonists, few in number, into a barbarous and unhappy country, where ever since, though surrounded with difficulties of every kind, they have maintained their ground; theirs has been no easy life, nor have their lines fallen upon very pleasant places; amidst darkness they have held up a lamp, and it would be well for Ireland were all her children like these her adopted ones."

Orange River, or **Gariep,** the largest river of South Africa, rising in the Drakensberg, forming part of the north boundary of Cape Province and the Orange Free State, and falling after a total course of about 650 miles into the Atlantic. Its tributary, the Vaal, forms the southern boundary of the Transvaal.

Orange Root (*Hydrastis canadensis*), a plant of the ord. Ranunculaceæ, found in Canada and the northern United States, with a thick underground perennial stem yielding a yellow dye.

Orato'rio. An oratorio is a musical setting for voices and orchestra of a sacred story, and includes recitatives, arias, duets, trios, &c., and choruses, with orchestral introduction or overture and possibly occasional interludes. A certain measure of the dramatic element is implied in its general plan, but the most typical examples of oratorio contain a large proportion of numbers of a purely contemplative nature. A stage representation is not intended, though it has been tried at least once, when Mendelssohn's *Elijah* was produced as a sacred opera. The enterprise was rewarded with only a qualified success. In its origin, however, oratorio had been associated with the stage, for it was originally the outcome of plays on Biblical subjects which, in combination with simple incidental music, had been introduced by Filippo Neri towards the close of the sixteenth century as a means of deepening the power and effect of religious instruction. These sacred performances were given in the Oratory of Santa Maria at Rome, of which Filippo Neri was the founder, hence the name oratorio. The term was not immediately adopted, the earliest of these sacred works being generally referred to as 'sacred dramas with music'.

As in the case of opera, the Italians, though they had originated the oratorio, were not able to carry it to its fullest development. This great work was reserved for Germany. Early in the seventeenth century Heinrich Schütz went from Saxony to Venice to study music, and imbibing there all the latest tendencies, returned to his native land and applied them, with all the sincerity of a deeply religious nature, to the composition of settings of the Resurrection and the Passion. Nearly a hundred years later Johann Sebastian Bach perfected the work by producing among many other fine examples of sacred music his wonderful setting of the Passion according to St. Matthew, universally acknowledged as the greatest oratorio which has ever been written. In this immortal work the story is related by various solo voices, with the chorus taking the part of the crowd, while reflections on the various incidents of the story are beautifully conveyed by solos, duets, choruses, and especially by chorales, harmonized with consummate art and intended in performance to be taken part in by the congregation.

The people of this country have always had a strong affection for the oratorio form, and when Handel, after a long career as a purveyor of Italian opera, turned his attention to it, he found a speedy recognition for what was generally felt to be his true *métier*. Most of his oratorios have a preponderating amount of the dramatic element, but it is noteworthy that the *Messiah*, which is the most universally popular musical work in this country, is entirely contemplative in character. Many oratorios have been written by British composers and also by foreign composers for British festivals. In the latter class the outstanding example is Mendelssohn's *Elijah*, written for the Birmingham Festival in 1846. Among native works first place must certainly be given to the sacred choral works of Sir Edward Elgar. *The Dream of Gerontius*, *The Apostles*, &c., are works of which any nation may well be proud.—BIBLIOGRAPHY: Grove's *Dictionary of Music and Musicians*, article *Oratorio* (vol. iii); A. W. Patterson, *The Story of Oratorio*; Robert Turnbull, *Musical Genius and Religion*.

Orbiculi'na, a genus of minute foraminifers, found alive in tropical seas, as also fossil in the tertiaries. They have their name from their flattened globular shape.

Orbit, in astronomy, the path of a planet or comet; the curve-line which a planet describes in its periodical revolution round its central body. The orbits of the planets are elliptical, having the sun in one of the foci; and the planets all move in these ellipses by this law, that a straight line drawn from the centre of the sun to the centre of any one of them, termed the *radius vector*, always describes equal areas in equal times. Also, the squares of the times of the planetary revolutions are as the cubes of their mean distances from the sun. The satellites also move in elliptical orbits, having their respective primaries in one of the foci. The *elements of an orbit* are those quantities by which its position, form, and magnitude, for the time, are determined; such as the major axis and eccentricity, the longitude of the node, the inclination of the plane to the ecliptic, and the longitude of the perihelion.

Orcagna (or-kȧn′yȧ), Andrea di Cione, one of the greatest of the early Florentine artists after Giotto, born in 1308, supposed to have died in 1368. He was the son of a goldsmith, who instructed the boy in the rudiments of his art. Painting, sculpture, architecture, and mosaic work were all within the sphere of his artistic genius; and his productions compare favourably with the best of a period so rich and distinguished in the art of Italy. As a painter he executed the beautiful frescoes in the Strozzi chapel in Santa Maria Novella at Florence; the chapel San Michele and its magnificent tabernacle in the same city are grand memorials of his architectural and sculptural talent. His style is remarkable for exquisite design, graceful pose, and delicate execution. Boccaccio has perpetuated his name in his *Decamerone*. His *Coronation of the Virgin* is in the National Gallery, London.

Orchard, an enclosure devoted to the culture of fruit-trees, especially the apple, the pear, the plum, the peach, and the cherry. The most suitable position for an orchard is a declivity lying well exposed to the sun and sheltered from the colder winds, but yet not too much shut in. The soil should vary according to the kind of fruit cultivated, and it is generally allowed to produce only grass besides the fruit-trees. Mixed fruit plantations, where the ground is continuously cultivated, are much more profitable, and are coming into increasing favour. They allow of an intermixture of standards or half-standards with bush apples or pears, the remaining space being occupied by small fruits and even vegetables. Bees are an important adjunct, and the suppression of insect and fungoid pests by systematic measures is essential. Fruit cultivation is carried on most extensively on the continent of Europe and North America, and is receiving increasing attention in South Africa, Australia, and New Zealand. In Great Britain the area of orchards is comparatively limited, although the flavour of the fruit produced is of the very best. The chief fruit-growing counties in England are Hereford, Devon, Somerset, Worcester, Kent, and Gloucester. Scotland has some orchards in Lanarkshire, Ayrshire, and Perthshire.

Orchardson, Sir William Quiller, British painter, born in Edinburgh in 1835, died in 1910. He exhibited in the Royal Scottish Academy till 1862, and then removed to London. He became A.R.A. in 1868, full Academician in 1879, and was knighted in 1907. He was among the first painters of his day, a fine colourist, and most of his works are skilfully dramatic and picturesque. Among his more notable pictures are: *The Challenge, Christopher Sly, The Queen of the Swords, Napoleon on Board the ' Bellerophon ', Un Mariage de convenance, Salon of Mme Récamier, The First Cloud,* and *The Young Duke.*

Orchella (or-kel′ȧ), name of several species of Roccella, a genus of lichens, originally brought from the Levant, and employed from very early times as a dye agent. Large quantities are gathered in the maritime rocks of the Canary and Cape Verde Islands. A purple and a red dye, known as orchil or archil, are prepared from them.

Orchestra. Of all man's achievements in music the modern full orchestra is from some points of view the most wonderful, summing up in the various instruments which compose it so much of mechanical ingenuity, and offering to the thoroughly equipped composer possibilities in the way of colour combination and consequently of musical eloquence which are almost without limit. Like all similar achievements it is the result of a long process of evolution, the earlier stages of which may be briefly traced. The first attempts at constituting an orchestra in the modern sense are coeval with the beginning of dramatic music, and date, therefore, from the early years of the seventeenth century. Monteverdi, the outstanding operatic composer of that time, by greatly increasing the number of instruments in his accompaniments, and especially by introducing for the first time so large a proportion of stringed instruments, played with a bow, must be regarded as the chief among the pioneers. But neither he nor his contemporaries had any fixed idea regarding the instruments most appropriate to be used, nor the relative proportions of the various tone-families which would give the desired results. These all-important matters could only be decided by time and experience, and it is possible to trace with fair completeness the gradual evolution from a heterogeneous collection of instruments to that ordered and stable arrangement which Haydn and Mozart always employed, and which is the essential part of the huge orchestras of to-day.

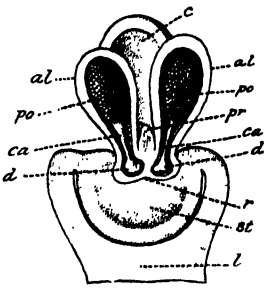
The full modern orchestra is made up of four distinct sections, comprising respectively the stringed instruments, the wood-wind instruments, the brass instruments, and the percussion instruments. The first three of these sections or families contain within themselves instruments of high, medium, and low pitch approximating in general to the soprano, contralto, tenor, and bass of an ordinary choir, and so are able at any time to stand alone and render a complete account of the musical scheme. In the string section the four voices are represented roughly by first violins, second violins, violas, and 'cellos and double basses, and among them they include a range of about six octaves. They are always present in considerable numbers in an orchestra of symphonic proportions, and the four parts which they normally represent are frequently multiplied by subdivision, especially in modern scores. Further, they are capable of greater technical execution than any other instruments, and for these various reasons are always regarded as the fundamental section of the orchestra. In the wood-wind department the four 'voices' are represented roughly by flutes, oboes, clarinets, and bassoons, while in the brass-wind section the instruments are trumpets, horns, trombones, and tubas; but it should be understood that in all three departments the analogy with the four voices of a chorus is only partial. All instruments have a wider range than any voice, and in many cases there are very striking and important differences of tone-quality in different parts of the compass, and the qualified composers know how to use these in giving the fullest possible expression to their musical ideas. Thus the topmost range of the 'cello is admirably suited for certain types of melody, and will frequently be found sounding above the violas, or even the violins. This overlapping of the various instruments for purposes of colour-effect is specially prevalent in writing for the wood-wind group. The percussion instruments include the drums, cymbals, triangle, bells, gong, &c., and are mainly used to emphasize the rhythm. Only the timpani, or kettledrums, and the bells give sounds of definite pitch. Such instruments as the piccolo, sounding an octave higher than the flute, the cor-anglais, sounding a fifth lower than the oboe, the bass-clarinet and the double bassoon, sounding an octave lower than their prototypes, and the tubas, the lowest of the brass instruments, are not always written for, but their use is quickly becoming universal, as is already the custom of writing for three each of the wood-wind group and four of trumpets and horns. The harp is also a regular constituent of the modern orchestra.—BIBLIOGRAPHY: Grove's *Dictionary of Music and Musicians*, article *Orchestra* (vol. iii), also *Instrumentation* (vol. ii); Hamilton Clarke, *A Manual of Orchestration* (popular); W. H. Daly, *The Concert-Goer: a Handbook of the Orchestra and Orchestral Music*; Cecil Forsyth, *Orchestration* (the best and most up-to-date work on the subject); Prout, *The Orchestra* (2 vols.).

Orchha (orch-hä'), or **Urchha**, a native state of Central India. It lies to the south of the British district of Jhansi, between that district and Chhatarpur; area, 2000 sq. miles; pop. 330,000. The chief towns are Tehri, the present capital, and Orchha, the old capital. Pop. of latter, 4000.

Orchidaceæ (or-ki-dā'sē-ē), or **Orchids**, an extensive order of monocotyledons (nearly 2000 species being known), consisting of herbaceous plants or shrubs, with fibrous or tuberous roots; a short stem or a pseudo-bulb; entire, often sheathing leaves; and showy flowers, with a perianth of six segments in two rows, mostly coloured, one, the lowest, generally differing in form from the rest, and known as the *labellum*. The essential organs are combined into a central *column*, which is the most characteristic feature of the flower. Normally only one stamen is fertile (two in Cypripedium), and the pollen is aggregated into a pair (rarely two or four pairs) of club-shaped pollen-masses (*pollinia*). The unilocular inferior ovary contains an immense number of ovules attached to three parietal placentæ. The pollination arrangements of orchids are very extraordinary (cf. Darwin, *Fertilization of Orchids*). They are natives of all countries, but very cold and dry climates produce but few species; some of them grow in the ground, but a large number are epiphytes, growing upon trees; and it is above all in the great virgin forests of South America and of the East Indies that the orchids abound. The orchids attract much attention, and are cultivated with zeal on account of the beauty or curious shapes of the flowers (which often assume the forms of reptiles, insects, and other denizens of the animal

Orchid (*Oncidium papilio*)

kingdom), or for their not unfrequently fragrant smells. The cultivation of orchids has of recent years become very fashionable, large sums being often paid for new or rare varieties. The nutritive substance called salep is prepared from the roots and tubers of several species; the fragrant vanilla is obtained from two species of a genus of that name.



Section of Orchis Flower

l, Portion of labellum. *st*, Stigma. *r*, Rostellum. *po*, Pollinia. *al*, Anther lobe. *ca*, Caudicle. *d*, Disk. *pr*, Prolongation of rostellum.

Orchis, the typical genus of the ord. Orchidaceæ, comprising hardy perennials with tuberous fleshy roots, containing much starch; natives of Europe, temperate Asia, and a few of North America. There are several British species with showy reddish-purple or pale-pink flowers. *O. mascŭla* yields salep. See *Orchidaceæ.*

Bee Orchis

Orcin, Orcinol, or **Dihydroxytoluene,** ($C_7H_8O_2$), a substance obtained from certain lichens, e.g. orchella weed, &c., by boiling with lime and water and extracting with ether. Orcin is a colourless crystalline compound soluble in water; its ammoniacal solution readily absorbs oxygen from the air and becomes purple in colour, and on the addition of acetic acid to this solution a red colouring-matter, *orcein*, is precipitated, which is one of the colouring-matters of the dyes prepared from lichens.

Ordeal, an ancient form of trial to determine guilt or innocence, practised by several nations of Europe, in the East, and by the savage tribes of Africa. In England there were two principal kinds of ordeal, *fire-ordeal* and *water-ordeal*, the former being confined to persons of higher rank, the latter to the common people. Both might be performed by deputy, but the principal was to answer for the success of the trial. Fire-ordeal was performed either by taking in the hand a piece of red-hot iron, or by walking barefoot and blindfolded over glowing coals or over nine red-hot ploughshares laid lengthwise at unequal distances; and if the person escaped unhurt, he was adjudged innocent, otherwise he was condemned as guilty. Water-ordeal was performed either by plunging the bare arm to the elbow in boiling water, escape from injury being considered proof of innocence, or by casting the person suspected into a river or pond, and if he floated without an effort to swim it was an evidence of guilt, but if he sank he was acquitted. It was at last condemned as unlawful by the canon law, and in England it was abolished by an Order in Council of Henry III. As success or failure, except in a few cases, depended on those who made the requisite preparations, a wide field was opened to deceit and malice. There was also the ordeal by battle, waged by the parties themselves or by champions on their behalf. This form of trial remained on the statute book until so recent a date as 1818, when, in consequence of the right having been claimed by a person accused of murder, an Act was passed to abolish it. Besides these ordeals there were a variety of others practised in many countries, such as the corsned or hallowed morsel trial; the trial by touching the dead body of a person murdered, which was supposed to bleed if touched by the murderer; the ordeal by swallowing certain herbs and roots; &c. After the fourteenth century ordeals became more and more uncommon. In the sixteenth century only the trial of the bier was used, and this continued even into the first part of the eighteenth. In consequence of the prevalent belief in sorcery or witchcraft the ordeal by cold water was long retained in the trials of witches. Isolated cases of these customs survived in some countries of Europe until comparatively recent times. Ordeals are still found in many nations out of Europe, as in West Africa and other parts of that continent. The Chinese still retain the ordeal of fire and water, and various ordeals are practised among the Hindus.—Biblio-

GRAPHY: E. A. Westermarck, *The Origin and Development of Moral Ideas*; H. C. Lea, *Superstition and Force.*

Ordeal Tree, a name of two poisonous trees: *Erythrophlœum guineense* of Guinea and *Tanghinia venenōsa* of Madasgascar. See *Erythrophlœum*; *Tanghin.*

Order, in zoology and botany, a subdivision of a class or large division of animals or plants, which, although agreeing in the characters common to the whole class, yet are more closely allied by some special features. Thus in the class Mammalia we have the order of the Primates, including lemurs, monkeys, apes, and men; in the class of Insecta we have the order of Lepidoptera, moths, and butterflies; in the class of Monocotyledonous Plants the order Liliaceæ; &c. An order of flowering plants is divided into tribes, which may be grouped in sub-orders; while an animal order is made up of families.

Orderi′cus Vita′lis, an Anglo-Norman chronicler, born in the neighbourhood of Shrewsbury in 1075, his mother being English, his father a French priest. He received his education in the Abbey of St. Evroul (Normandy), where the name Vitalis was conferred on him, and in due time he became a priest. He wrote in Latin an ecclesiastical history in thirteen books, from the birth of Christ down to his own time. The later books are a valuable contribution to history, as they offer a good description of the life and times of William the Conqueror, of William II, and of the first of the Crusades. He died after 1143.

Order of Merit, a very exclusive British order instituted by King Edward VII on 26th June, 1902. The order carries with it no special title or precedence, but those who have received it have the right to put the letters O.M. after their names. The badge consists of a red enamel gold cross, patée convexed, with the words 'For Merit' in gold letters within a laurel wreath on a blue enamel centre. On the reverse side is the imperial and royal cipher on a blue ground. The badge is surmounted by an imperial crown, and is suspended by a parti-coloured ribbon, half blue and half crimson. Naval or military recipients of the order have two silver crossed swords with gold hilts, placed saltirewise between the angles of the cross. The badge is not worn in miniature, neither is the ribbon sewn on the coat, for the regulations lay down that officers in uniform are to wear the badge round the neck on all occasions.

Orders, Holy, a term applied to the different ranks of ecclesiastics. The Anglican and other Reformed Episcopal churches recognize only the three orders of bishops, priests, and deacons. The Roman Catholic Church admits of seven orders: four minor or secular—doorkeeper, exorcist, reader, and acolyte; and three major—deacon, priest, and bishop. The Greek Church has also the distinction of major and minor orders, but the functions of the four minor orders of the Roman Catholic Church are united by the Greeks in the single order of reader. The term *holy orders*, or simply *orders*, is also used as equivalent to the clerical character or position, as 'to take orders', 'to be in orders'.

Orders, Military, fraternities or societies of men banded together in former times for military and partly for patriotic or Christian purposes. Free birth and an irreproachable life were the conditions of admission. The chief were the Templars, the Teutonic Knights, and the Order of St. John of Jerusalem.

Orders of Architecture, the chief styles or varieties exhibited in the architecture of the Greeks and Romans. Technically the chief feature of the order is the column—including base, shaft, and capital—and its superincumbent entablature (consisting of architrave, frieze, and cornice). The character of the order, however, is displayed not only in its column, but in its general forms and detail, of which the column is, as it were, the regulator. There are five classic orders, namely Grecian:—Doric, Ionic, and Corinthian; Roman:—Tuscan, and Roman or Composite. See *Architecture*; *Column.*

Ordinal, the prescribed form of service used at the ordination of clergy, as in the English, Roman Catholic, and Eastern Churches. The ordinal of the English Church was originally drawn up in the time of Edward VI. It was altered to some extent in the reign of Queen Elizabeth, and again revised in 1661.

Ordinary, in English law, a bishop, or other person having peculiar or original ecclesiastical jurisdiction in a diocese, in contradistinction to extraordinary or delegated jurisdiction. In Scotland the epithet *ordinary* is applied to certain judges in the outer house of the Court of Session, such judges being termed *lords ordinary*; and the sheriff of a county is called the *judge ordinary.* As a nautical term an *ordinary* seaman is one not qualified to take the helm or sail the ship, and is thus distinguished from an *able* seaman.

Ordination, the initiating of a Christian minister or priest into his office. The English Church considers ordination as a real consecration; the High Church party maintaining the dogma of the regular transmission of the episcopal office from the apostles down to the bishops of the present day. For ordination in the English Church, subscription to the Thirty-nine Articles is requisite. The ceremony of ordination is performed by the bishop by the imposition of hands on the person to be ordained. In most Protestant countries with a State Church, ordination is a requisite to preaching; but in some sects it is not held necessary. In the Presbyterian and Congregational Churches ordination means the act of settling a licensed preacher over a congregation, or conferring on him general powers to officiate wherever he may be called.

Ordnance Department. In modern times this term is not used in connection with any one branch of the army, but may still be applied conveniently to include a variety of organizations dealing with munitions of war, and all being complementary to each other.

(*a*) The Department of the Master-General of the Ordnance. The fourth military member of the Army Council is known as the Master-General of the Ordnance, and is responsible to the Secretary of State for War for the entire work of his department of the War Office. The department consists of three main divisions, each under its own director, and dealing with (1) artillery, (2) fortification and works, (3) factories.

(*b*) The Ordnance Committee, presided over by an admiral with a senior military office as vice-president, and having equal numbers of naval and military officers as members. This committee is subject to the Master-General.

(*c*) The Ordnance Factories.

(*d*) The Royal Army Ordnance Corps, comprising the personnel of the corps and organized in sections for home and companies for foreign service. The officers of the corps have the usual military rank, but are classed for departmental purposes as ordnance officers first to fourth class, according to the appointment held.

(*e*) The Royal Army Ordnance Corps establishments include 'ordnance central depots', 'ammunition depots', and the 'Royal Army Clothing Department and Factory', and it is in this last only that the Royal Army Ordnance Corps appears in the rôle of manufacturer. The 'ordnance factories' proper, as in (*c*), are to all intents and purposes civil departments, and the R.A.O.C. deals only with the finished products much as does the wholesale firm in civil life. In the case of the clothing department, however, it is both manufacturing and distributive, all articles of clothing for the troops being manufactured at Pimlico and issued to units on demand. For purposes of supply of ordnance stores in peace-time the country is divided up into areas, each in charge of an officer known as a Deputy Assistant Director of Ordnance Services; in war the same official superintends the work of ordnance depots in the field, and issues ordnance stores and clothing to units.

With regard to the title of the Master-General of the Ordnance, the following extract from Grose's *Military Antiquities* may be of interest as showing that—comparatively at any rate—the duties of the Master-General are on much the same lines now in the days of heavy guns as they were in the time of King Richard III, when the office first originated, and when the principal items of supply were no doubt bows and arrows, battle-axes, and lances. As quoted by Grose, the "Master of the Ordonnance" is to see that the troops "lacke no kynde of municion or such other necessaries which apperteine to the said Mr. of th' Ordonnance".

Ordnance Survey, the official survey of Great Britain and Ireland, originally instituted under the direction of the Master-General of the Ordnance. The name is also applied to the department of the Civil Service which carries out the work. The first step towards the production of a topographical map of any part of the United Kingdom was taken shortly after the rebellion of 1745, during the course of which the want of a reliable map of the Highlands had been much felt by the Government forces. A map was made of the Highlands, and one of the rest of Scotland followed. With a view to the production of an accurate map of the whole kingdom, General Roy in 1783 measured a base on Hounslow Heath, and in 1791 the Ordnance Survey Department came into official existence. When the Board of Ordnance was abolished in 1855, the survey was placed under the War Office. In 1870 it was transferred to the Board of Works, and in 1890 to the Board (now the Ministry) of Agriculture and Fisheries. The staff consists mainly of officers and men of the Royal Engineers, controlled by a Director-General, with head-quarters at Southampton. The survey for the 1-inch map was begun in 1794, and the first sheet was published in 1801. In 1824 the work was transferred to Ireland, where the scale adopted was 6 inches to the mile, a large-scale map being needed for the purposes of land valuation. The Irish survey was completed in 1840, and in the same year a survey of Great Britain for a map on the 6-inch scale was begun. Work on the scale of 1/2500, or approximately 25 inches to the mile, was commenced in 1854, and sheets to this scale are now available for all cultivated parishes. The 1/2500 map is periodically revised, no sheet being allowed to go more than twenty years out of date. In England and Scotland the second revision is now going on. A survey for a map of Ireland to the same scale was begun in 1887. The 6-inch map is a reduced copy of the 25-inch, and is itself used as the basis for the 1-inch and smaller scales. The 1-inch map is revised every fifteen years. The smaller maps, with scales ½-inch, ¼-inch, $\frac{1}{10}$-inch, and 1/1,000,000 are made by reduction from the 1-inch. For towns of 4000 or more inhabitants, maps are provided on the scale 1/500.

Scientific surveys have been carried out by the State in nearly all civilized countries. Worthy of special mention are the Coast and Geodetic Survey of the United States, which dates from 1817, and the Trigonometrical Survey of India, which occupied the years from 1832 to 1881. The Geological Survey of the United Kingdom began operations in 1832. Its results are published on the 1-inch Ordnance Survey maps. For practical details see *Surveying*.

Ordonnances was the name given in France, before the Revolution of 1789, to decrees, edicts, declarations, and regulations issued by the king or regent. From 1789 until the Restoration in 1814 the ordonnances were replaced by decrees of the executive. Since 1848 the term ordonnances has disappeared, and is replaced by *decrees*.

Ordovician, a name substituted by C. Lapworth in 1879, for the geological system and period that were previously called Lower Silurian or Upper Cambrian. The Ordovices were a tribe inhabiting North Wales.

Ore, a naturally occurring body which contains a metal or metals in the mineral form, in sufficient quantity and in such a condition as to make its extraction a profitable undertaking on a commercial scale at a given time and place. The commonest are metallic sulphides, e.g. galena and iron pyrites. Oxides and carbonates are also frequently met with. If the metal occurs in the free state in nature, it is said to be *native*. Metals are commonly obtained from their ores by smelting. Ores are commonly found in veins or lodes. See *Mining*, and the articles on the different metals.

Örebro (*eu'*re-brų), a town of Sweden, capital of the län or county of same name, at the western extremity of the Hjälmar Lake. It has an old royal castle, now used as a museum, and a considerable trade with Stockholm by the Hjälmar and Maelar Lakes and the Arboga Canal. Örebro is the seat of the principal State Railway workshops, and is an important railway junction. It was once the residence of Gustavus Vasa and of Charles IX. Pop. (1919), 216,080.

Or′egon, a maritime state in the Pacific division of the United States. It is traversed by the Cascade range (Mount Hood, 11,760 feet). There is a low coast range, and between it and the Cascade range is the valley of the Willamette, which joins the valley of the Columbia River (the northern boundary of the state). Excepting for these two valleys Oregon is everywhere mountainous. The state capital is Salem (pop. 1920, 17,679); other cities are Portland (258,288), Eugene (14,027), Astoria (10,595), and Medford (5756). There is a railway mileage of 3214, and an additional 722 miles of electric track, the principal systems being the Oregon Railroad and Navigation Company (owned by Union Pacific), the Southern Pacific, and the Astoria & Columbia River. The Columbia and Snake Rivers are open to navigation up to 570 miles from the sea by means of the Dalles and Celilo Canal (opened 1915). Portland is at the head of sea-borne navigation on the Columbia River. About one-seventh of the population is foreign born. Indian Reservations occupy (1919) 1889 sq. miles; pop. 3912, but there are about 3000 other Indians within the state. The principal religious bodies are Catholic, Methodist, and Presbyterian. In the Willamette Valley the rainfall is good, and all the crops of a temperate zone are raised. East of the Cascade range the land is semi-arid, but will be considerably improved by irrigation. One-sixth of the standing timber of the United States is found in the Oregon afforested areas, which occupy (1920) 20,000,000 acres. Wheat, oats, barley, root crops, sugar-beet, plums, apples, pears, and, in places, loganberries and strawberries are raised. Fish are abundant, and include the halibut, oyster, salmon, and sturgeon. There is some mineral wealth in gold, silver, and copper, and in coal, granite, lead, gypsum, platinum, and occasional precious stones. Education is compulsory between the ages of nine and fifteen years. There is an agricultural college at Corvallis (founded 1870), a university at Eugene (founded 1876), and several denominational colleges. Area, 96,699 sq. miles (1092 sq. miles being water); pop. (1920), 783,285.

Oregon joined the Union on 14th Feb., 1859. There are 36 counties. Modern government consists of a Governor and a Legislative Assembly, comprising a Senate (30 members, elected for four years, one half retiring biennially) and a House of Representatives (60 members, elected for two years). The referendum principle has been adopted with modifications. Two Senators and three Representatives are sent to Congress. —Cf. J. B. Horner, *Oregon: her History, Great Men, and Literature*.

Orel (Russian pron. or-yol′), a central government of Russia, south of the Tula and Kaluga; area, 18,042 sq. miles. Grain, hemp, hops, and tobacco are raised, and live-stock, particularly horses, are extensively reared. Manufactures are chiefly confined to the distillation of spirits. The principal rivers are the Oka, the Desna, and the Sosna. Pop. 2,816,000.

Orel, a town of Central Russia, capital of the government of Orel, at the junction of the Oka and Orlik Rivers; served by four converging lines of railways, and by canals connecting with the Caspian, the Black Sea, and the Baltic. Pop. 97,000.

O′renburg, a government of Eastern Russia, partly in Europe and partly in Asia; area 73,816 sq. miles; pop. 2,272,000. A very large part of the surface consists of steppes, but the agricultural districts in the north-west supply large quantities of grain for export. Gold abounds along the whole Ural chain, and there are also copper-, iron-, and salt-mines. The population consists chiefly of the Finnish Votiaks and Tepyaks, and Tartar Bashkirs.

Orenburg, a town of Eastern Russia, capital of the government of Orenburg, on the Ural; served by the Orenburg-Tashkent Railway. Soap, candles, and hardware are manufactured, and there is a large trade with Khiva and Bukhàra. Pop. 98,000.

Orense, a mountainous inland province of North-West Spain, traversed by the Minho. Fruit is extensively grown in the temperate valleys; cattle are raised, and iron is mined. It forms the southern portion of the old Kingdom of Galicia. Area, 2697 sq. miles; pop. 408,700.

Oren′se (ancient **Aurium**), a city of Spain, capital of the province of Orense, on the Minho, which is crossed by a bridge built in 1230 by Bishop Lorenzo. It is about 1300 feet long and 130 feet high. The cathedral was founded in 1220. Near by are the hot (sulphur) springs of Las Burgos, and the baths of Caldas de Orense, which were known to the Romans. Pop. 2697.

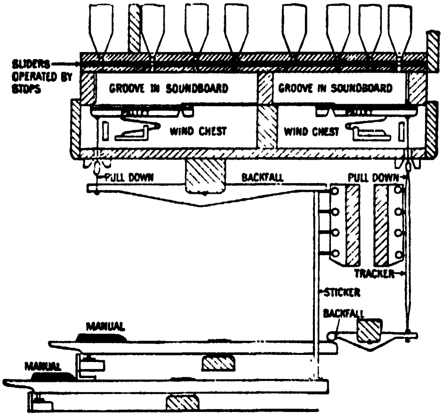
Oreodaph′ne, or **Mountain-laurel**, a genus of plants of the nat. ord. Lauraceæ. The fruit of *O. opifĕra*, a native of Northern Brazil, yields a volatile oil, which is used as a liniment, and when kept for a short time deposits a quantity of camphor. *O. bullata*, found at the Cape of Good Hope, is called *stinkwood* on account of the disagreeable odour of its wood, which, however, is hard, durable, and takes an excellent polish.

Oreodoxa, a genus of tropical American palms. *O. regia* is the royal palm or palmiste, one of the noblest of the tribe; *O. oleracea* is the cabbage palm.

Ores′tes, in Greek mythology, the son of Agamemnon and of Clytemnestra. When his father was murdered, he was saved from a similar fate by his sister Electra. He was sent to Phocis, where he formed an intimate friendship with Pylades, the son of King Strophius. He was then called upon by the Delphian oracle to avenge his father, and hastened to Mycenæ, where he slew Clytemnestra and Ægisthus. For this murder he was relentlessly pursued by the Eumenides or Furies, and only succeeded in appeasing those terrible goddesses by carrying out the instructions of the Delphian oracle to bring back the statue of Artemis from Tauris to Argos. Married to Hermione, daughter of Menelaus, Orestes ruled over his paternal kingdom of Mycenæ, and over Argos, upon the death of its king. Orestes is the hero of several Greek tragedies, notably the *Choēphori* and the *Eumenides* of Æschylus, the *Electra* of Sophocles, and the *Orestes* and *Iphigenia in Tauris* of Euripides.

Organ. In the fourth chapter of *Genesis* Jubal is called "the father of all such as handle the harp and organ", but it need scarcely be said that the organ there spoken of bore no striking resemblance to the mechanical marvel so often referred to at the present day as the 'King of Instruments'. No doubt the fact was early discovered that sound could be made by the passing of air across the end of a tube, and that the pitch of the sound depended upon the length of the tube; and a collection of graduated tubes such as the Punch-and-Judy showman frequently uses to-day is probably much nearer in essence to Jubal's 'organ' than is our modern instrument. Nevertheless we of to-day in building our organs are linked with Jubal and his period by means of a common method of tone-production, which brings sound from pipes by means of air pressure. The history of the progress from Jubal's 'Pan's-pipe' to the modern organ is largely conjectural until about the eleventh century of the Christian Era, but it can be shown that some of the most important ideas in connection with the instrument had been discovered in pre-Christian times, though the power to take full advantage of them, depending entirely on mechanical invention, had to await the slow development of man's mechanical ingenuity. It will suffice here to say that the early organs were of a very primitive type indeed, and called for severe exertion on the part of the performer. The keys were at least three inches wide and had to be moved with a blow from the clenched fist. Hence the name *pulsator organorum* frequently given to organists of that period. From about the second half of the fifteenth century progress became gradually more rapid, and it has been maintained up to the present day, when organ-builders vie with each other in the elaborating of mechanical contrivances and of mechanical means of bringing them under the control of the player.

The modern organ of large dimensions generally has four manuals, or keyboards (though some have five), and a set of keys placed under the player's feet and called the pedals. The pedals have a range of 2½ octaves and the manuals a range of 5 octaves. The number of 'stops' may be from 60 to 70 or even more, and there are, further, many mechanical devices for coupling up the various manuals with each other or with the pedals and for performing other useful functions. It is obvious that the mechanism required for such an instrument must be very elaborate indeed, and no attempt can be made here to explain it in detail, but a brief explanation of the accompanying diagram will make clear the means of connection between the key-board and the sounding pipes. The section shown is of a two-manual instrument, but the principle is the same in all cases. When a key on the manual is depressed, the other end of it in rising actuates the backfall, either directly as in the case of the upper manual of the diagram, or through the medium of a sticker. This backfall (which, like the key, is a lever) either directly or through the help of the tracker moves the pull-down, which in its turn opens the pallet in the wind chest. This wind chest is filled with air at the required pressure, supplied from the bellows by means of a wind trunk (not shown in the diagram). As soon as the pallet is pulled down the wind rushes into the groove in the sound board and, if the way to the pipe is clear, escapes through it, and, in doing so, sounds the pipe. Since the pallet will remain down as long as the key remains depressed, the wind will continue so long to have access to the pipe, and the pipe will continue to sound. The sliders are wooden boards which move back and forward horizontally in response to the pulling-out or pushing-in of the draw-stops. They are pierced at the proper distances with holes which exactly correspond to the 'feet' of the pipes, and when the stop is drawn out these holes come into position each immediately beneath its own pipe, so that every pipe belonging to the register drawn is ready to sound. Now, if a key is depressed the pallet in connection with it allows the wind into the corresponding groove in the sound board and the pipe speaks.



Diagrammatic Section of a Two-manual Organ

Organ pipes are made either of metal or wood, and as regards their manner of producing sound are divided into two classes, flue pipes and reed pipes. The great majority are of the flue class, and produce their tone through the resonance of the enclosed column of air, which is set in vibration by the current of compressed air forced through a slit at the foot of the pipe. In reed pipes the reed is the sound generator. This thin strip of metal is so placed at the base of the pipe as to come in contact with the stream of compressed air as it enters, and so is set in vibration. Flue pipes are either open or are closed at the top. In the latter case the pitch of the note is an octave lower than that given by an open pipe of the same length. The quality of the tone is also changed, due to the removing of half of the upper harmonics (see *Octave*). On the *Great* manual most of the foundation stops such as the Diapasons are to be found; on the *Swell* manual the chief reed stops are generally placed, perhaps because they are specially effective for that increasing and decreasing of the tone amount which is made possible on this manual by means of the shutters. They form one side of the swell box, which encloses all the pipes on this manual, and which can be opened or closed at will by means of a foot lever. On the Choir organ are to be found soft stops suited for accompaniment purposes, and on the Solo organ the various 'fancy stops' are placed. Mechanical contrivances called couplers enable the player to join any two manuals together or any manual to the pedal board, and so have the resources of both made available from one.—BIBLIOGRAPHY: Grove's *Dictionary of Music and Musicians*, article *Organ* (vol. iii); Hopkins and Rimbault, *The Organ: its History and Construction*; A. Eaglefield Hull, *Organ Playing: its Technique and Expression*; H. Hiles, *Catechism of the Organ*; Rev. Noel A. Bonavia-Hunt, *The Church Organ: an Introduction to the Study of Modern Organ Building*.

Organ, Organization. In biology, the term *organ* is applied to all the definite parts with special functions, forming as a whole the structure of a living body, whether animal or vegetable. The dissimilarity between the organs of which a living being is composed forms a very striking contrast to the structure of lifeless bodies. A lifeless body—such as a mineral—exhibits generally a sameness or homogeneity of structure. Its intimate parts or particles are usually of a similar kind or nature. Hence this broad and patent distinction has resulted in the employment of the terms *organic* and *organized* to express the characteristics of living beings; whilst to the lifeless part of creation the opposing term *inorganic* is applied. *Organization* thus means the possession of definite organs, structures, or parts, which have definite relations to each other; and an *organism* is a whole, an animal or plant, possessing such organs.

Organic Chemistry, the chemistry of the compounds of carbon (compare the section on *Organic Chemistry* in the article *Chemistry*). Until comparatively recent times the number of carbon compounds known was small, and these were derived from animal or vegetable sources, hence the belief that they could not be prepared in the laboratory, but required some 'vital force'. In 1828 Wöhler succeeded in producing urea, an animal product, from the substance ammonium cyanate; thus urea was built up without the aid of a vital force. This was at first regarded as an isolated case, but it marked the turning-point in organic chemistry, and from that time we may date the beginning of synthetic chemistry of the carbon compounds, and the overthrow of the idea of organic origin for all carbon compounds. At the present day many thousands of carbon compounds are known, and the number is being increased yearly by the synthesis of new compounds. The number of carbon compounds exceeds the number of compounds of all the other elements put together. The carbon atom can unite with other carbon atoms to an extraordinary degree. A few of the other elements show a tendency to unite with each other, but the chains are never long, whereas in carbon compounds exceedingly complex substances are built up owing to the special combining power of the carbon atom. Carbon in the majority of its compounds is tetravalent, and the recognition of fixed valency (q.v.) and the tetravalent nature of the carbon atom, due to Couper and Kekulé (q.v.), has done much to elucidate the structure of carbon compounds and to develop organic chemistry.

Organic or carbon compounds are divided broadly into the *aliphatic* or open-chain compounds, or methane derivatives; the *aromatic*, closed-chain, or homo-cyclic compounds, or benzene derivatives; and the *hetero-cyclic* compounds, in which the ring is not completely built up of carbon atoms, but may contain nitrogen or sulphur, &c. Classification of the compounds is greatly simplified by arranging the compounds in homologous series (see *Chemistry*). A type member of each series may be used to show the general properties and general methods of preparation of any other member. Thus amongst the hydrocarbons (q.v.) there are the *paraffin series*, methane (CH_4), ethane (C_2H_6), &c.; the *olefine series*, ethylene (C_2H_4), propylene (C_3H_6), &c.; the *acetylene series*, acetylene (C_2H_2), &c.; the *benzene series*, benzene (C_6H_6), toluene (C_7H_8), &c. Certain groups of atoms are typical of different classes of compounds; thus, *alcohols* all contain one or more hydroxyl groups (OH) united to carbon, *ketones* contain the carbonyl (CO) group united to carbon, *aldehydes* the group (CHO), acids the carboxyl group (COOH), and so on, the particular group conferring certain characteristics on the compound.

In organic chemistry the arrangement of the atoms in the molecule is taken into consideration, and until the use of structural formulæ in organic compounds had developed very little progress was made. In inorganic chemistry it is sufficient to know the molecular formula for a substance; e.g. Na_2CO_3 represents sodium carbonate and only sodium carbonate. On the other hand, the formulæ C_2H_6O represents not merely ethyl alcohol but also methyl ether, and these substances are totally different in chemical properties; hence in organic chemistry some knowledge of the structure of the molecule must be obtained. Kekulé did much to develop structural formulæ. He introduced the idea that the carbon atom may be regarded as being situated at the centre of a tetrahedron with the valencies directed to the apices, and from this he developed for many substances structural formulæ which were afterwards proved correct by building up the compound from its elements, using these formulæ. By ascertaining the structure of a substance it became possible to synthesize the substance, and theoretically there is no organic compound, no matter how complex, which cannot be built up from its elements if the constitution is known. The making of structural formulæ marks the first great stage in the advance of organic chemistry. When the structure is understood it becomes only a question of time, and the finding of correct conditions, to synthesize the compound required. One of the best known examples of this is the substance *indigo*, a dye obtained from the indigo plant. The dye is a valuable one, and research was started to find the chemical composition of the substance. When that was found, the substance was synthesized, although it took some time before this 'artificial' or synthetic indigo could be manufactured sufficiently cheaply to compete with the natural product. Many instances of this kind could be cited. Sixty years ago few organic compounds were known, and these, in many cases, were not pure, and their constitution was not known. Since that time development has been rapid; Kekulé with his ring structure for benzene paved the way, and results quickly followed. The wonderful range of synthetic colouring matters in use at the present day shows how much organic chemistry has advanced. Before the time of Perkin (q.v.) dyes were prepared from natural colouring matters, such as the madder root from which alizarine was prepared. Perkin investigated the tarry residue from the manufacture of coal-gas, and from that abstracted by fractional distillation numerous substances, amongst these the compound anthracene; from anthracene he prepared alizarine, and so succeeded in synthesizing the natural colouring matter of the madder root. Alizarine and its derivatives form a series of adjective dyes. Coal-tar yields also hydrocarbons, phenols, cresols, naphthalene, &c., all organic substances which are the starting-points in the preparation of synthetic dyes, drugs, and explosives.

Modern *explosives* (q.v.) are the result of much research in organic chemistry. The high explosive 'T.N.T.', trinitrotoluene, is prepared by nitration of toluene obtained from coal-tar. Picric acid, another substance used in the preparation of explosives, is obtained by nitrating phenol. Nitroglycerine, one of the ingredients of dynamite, is obtained by forming the nitric ester of glycerine, a by-product in the manufacture of soap.

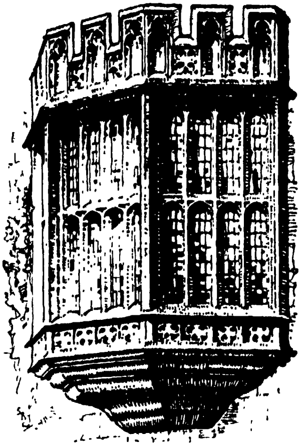
The process of *fermentation* (q.v.) has been known for a long period, but only in recent years have fermentation processes been studied. To Pasteur is due the advance in this branch of chemistry. Pasteur proved fermentation to be a chemical process brought about by chemical agents known as enzymes. These enzymes are present in certain bacteria, and by means of these large amounts of material may be caused to undergo profound chemical change. Thus, sugars may be broken down to ethyl alcohol and carbon dioxide by an enzyme present in yeast cells; alcohol may be caused to oxidize rapidly in air to acetic acid by means of an enzyme present in the micro-organism *mycoderma aceti*. Many fermentation processes of this kind are now in use.

Many *alkaloids* have been synthesized, and several which were regarded as simple substances have been proved to be mixtures of substances. Great advance has been made in the synthesis of drugs. Drugs were originally obtained from natural sources by expressing the juice of roots and leaves of plants; synthetic drugs have now largely superseded these. Such substances as antifebrine or acetanilide, phenacetine, antipyrine, aspirin, and many other antipyretics are made from derivatives of benzene. Hypnotics such as chloral, paraldehyde, and sulphonal are prepared from derivatives of methane. Local anæsthetics such as novocaine, β-eucaine, substances less harmful than cocaine, are also derivatives of methane. Salvarsan and atoxyl are synthetic organic compounds containing arsenic. Industry owes a large debt to the development of structural organic chemistry, and almost every substance in use at the present day is manufactured pure and in quantity as a result of careful research into chemical constitution and synthetic methods. In the plant, complex organic substances are built up from simple substances such as carbon dioxide, water, and alkali nitrates; from these, colouring matters, starch, cellulose, sugars, and acids are formed. By examining these substances the organic chemist has learned much, and has been able to synthesize many of them, but how they are formed continuously and apparently easily in the plant is not yet fully understood. Recently research on photosynthesis has made it clear that light of a particular wave-length plays an important part in building up these complex substances. We have in the plant a very perfect factory for the manufacture of organic compounds. For bibliography see *Chemistry*.

Organic Radicals, in organic chemistry, groups of atoms such as the methyl radical CH_3 and the nitro-radical NO_2, which exist in whole series of compounds.

Oriel College, Oxford, a college founded in 1326 by Edward II on the suggestion of Adam de Brome, his almoner, for a provost and ten fellows. St. Mary's Hall, founded 1325, has since 1902 been united with Oriel College. Among those connected with Oriel College were William Langland (author of *Piers Plowman*), Sir Walter Raleigh, Bishop Butler, Matthew Arnold, and Cecil Rhodes, who left a large sum of money to the college.

Oriel Window, a window projecting from the outer face of a wall, in plan semi-hexagonal, semi-octagonal, or rectangular, thus having three or more sides, divided by mullions and transoms into different bays and other projections, and supported by brackets or corbels. A projecting window rising from the ground is sometimes called an oriel, but is more properly a bay-window.



Oriel Window, Lacock Abbey, Wiltshire

Orientation, a turning towards the east; the direction of something towards the east. By ecclesiologists it is used in regard to the building of churches in a direction east and west, though often a deviation from the true east has been observed to exist in churches which had been supposed to stand exactly east and west.

Oriente, an inland territory of Ecuador, South America, roughly triangular in shape, and forming a wedge between Colombia (north) and Peru (south). In area it occupies about half the state, and lies almost wholly in the valley of the Marañon (Upper Amazon). Towards the west the land rises to form a formidable western boundary in the Cordillera Oriental of the Andes, which has done much to hinder development, although the western areas of Oriente are eminently suitable for cotton-growing. Archidona is the territorial capital. Pop. (territory), about 90,000.

Oriflamme (Lat. *aurum*, gold, and *flamma*, flame), until Charles VII's reign, the sacred royal standard of France. The earliest military standard of the Frankish monarchy was the blue banner of St. Martin, but from the time of Louis VI it was replaced by the oriflamme of the abbey of St. Denis, which was presented to the comte de Vexin, lord-protector of the convent. When Philip I united Vexin to the possessions of the Crown, it fell to him to bear the banner as protector of the abbey. It was a piece of red taffeta fixed on a golden spear, in the form of a banner, and cut into three points, each of which was adorned with a tassel of green silk.

Origen (Origenes, surnamed *Adamantius*), one of the greatest and most influential of the Greek Fathers, born probably at Alexandria A.D. 185–186, died at Tyre 253 or 254. His father suffered martyrdom at Alexandria in 202 under the Emperor Severus. A pupil of Pantænus and Clement, Origen lectured with much success in Alexandria, and gained the patronage of Bishop Demetrius. His own studies were pursued with extraordinary zeal; he lived an ascetic life, and is said to have become a eunuch in order to be free from the lusts of the flesh. A journey to Rome during the episcopate of Zephyrinus greatly increased his reputation, and Christian communities in various countries vied with each other in securing his services. About 228 he visited Palestine on his way to Greece, and at Cæsarea was ordained a presbyter. Apparently Demetrius disapproved of Origen's admission to the priesthood; at any rate, he forced Origen to leave Alexandria in 231, afterwards excommunicating him. Origen settled at Cæsarea, which became thenceforth the centre of his labours. In a new persecution, under the Emperor Decius, Origen, who was viewed as a pillar of the Church, was thrown into prison at Tyre, and subjected to the most cruel sufferings, ultimately resulting in his death. He was a great speculative theologian, and wielded a determining influence upon subsequent Christian thought, and, in particular, upon the doctrines of the Trinity and the Person of Christ. He was credited with some 6000 works, doubtless the exaggeration of popular report. Of his extant works perhaps the best known are the *Peri Archōn* (*De Principiis*) and the *Contra Celsum*. This last is considered as the most complete and convincing defence of Christianity of which antiquity can boast. See *Hexapla*.—BIBLIOGRAPHY: Adolf Harnack, *History of Dogma*; W. Fairweather, *Origen and Greek Patristic Theology*.

Original Sin, a term used to designate the sin which Adam committed, but more particularly the tendency of evil in man, his disposition to sin, in consequence of the fall and the hereditary stain man has inherited from Adam. St. Paul (*Romans*, v, 12) taught the doctrine of original sin, when he wrote: " Wherefore, as by one man sin entered into the world, and death by sin; and so death passed upon all men, for that all have sinned ". Adam had thus transmitted to the human race not only death but also sin.

The first of the Fathers of the Church who expounded systematically the doctrine of original sin was St. Augustine. In opposition to Pelagius (q.v.), Augustine taught that death was brought into the world by Adam's sin; that man's free-will, the reflex of the divine free-will, was lost to him by the fall as regards good; and that there remained only spontaneity, the negation of outward constraint, and free-will as regards evil. Men differ in their individual character solely by their varying grades of evil.

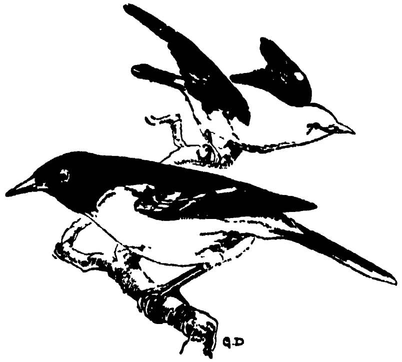
In the ninth century the controversy regarding original sin was revived by John Scotus Erigena, who held the infection of man's nature to be the result of its original constitution. Anselm of Canterbury, Peter Lombard, and Thomas Aquinas took the lead in the controversy.

The reformers of the sixteenth century upheld the Augustinian view. From Luther down to modern times the doctrine has been defended and attacked by philosophers and theologians. Kant represented original sin as an inherent tendency in man's nature to evil, whilst according to Hegel original sin is only the necessary finitude and limitation of human nature. See *Free-will*; *Grace*.—Cf. F. R. Tennant, *The Sources of the Doctrines of the Fall and Original Sin*.

Orihuela, a town of Alicante, Spain, on the Segura, and in a plain known as the Garden of Spain. It is on the Murcia-Elche Railway. Orihuela has been a bishopric since 1265. It was the Auriwelah of the Moors, who occupied it from 718 until its recapture by Don Jaime I of Aragon in 1265. Pop. 35,000.

Orino'co, a river of South America, one of the largest in the world, rising in the Sierra Parima, in Venezuela. After a circuitous course it falls into the Atlantic opposite Trinidad, its principal mouth being 20 miles wide; length, about 1600 miles. The Orinoco is connected with the Rio Negro, a tributary of the Amazon, by the Cassiquiari, a natural canal joining the two rivers, and it receives the waters of many large rivers. During the rainy season it inundates the immense plains through which it flows, presenting to the eye a boundless expanse of waters. The scenery on its banks is magnificent beyond description. Two remarkable rapids occur in the upper part of the Orinoco, and from these the river is navigable to its mouth (about 780 miles).

O'riole, a name popularly applied to two families of perching birds. The American orioles constitute the family Icteridæ, closely allied to finches. The Baltimore-bird (q.v.), oriole, or golden robin (*Ictĕrus baltimore*) is a familiar species of this family. Here too belong the bobolink (*Dolichonyx oryzivorus*), the crow-blackbird (*Quiscalus versicolor*), and the curious cow-birds (Molobrus), most of which have cuckoo-like habits. The orioles proper, or those of the Old World are included in the family Oriolidæ. They are found in Asia, Africa, the islands of the Indian Archipelago, and Southern and Eastern Europe. The golden oriole (*Oriŏlus galbŭla*) is the typical form, and the only European member of the group. The wings and tail of the males are black, and contrast powerfully with the golden colour of the body. In size it resembles a common thrush or blackbird. It chiefly inhabits Southern Europe, but is occasionally found in Britain. The song is loud and resembles the sound of the flute. The Indian mango-bird (*O. Kundoo*) is very similar in appearance.



Baltimore Oriole (*Ictĕrus baltimore*). Golden Oriole (*Oriŏlus galbŭla*) in flight

Ori'on, in Greek mythology, a giant hunter. According to Homer, he was a beautiful youth, of whose charms Eŏs (Aurora) became enamoured. The gods were jealous of her love, and Artemis slew him with her arrows. According to other writers, he died of the sting of a scorpion. The hero after his death was placed with his hounds in the heavens as a constellation, which bears his name.

Orion, a constellation situated south of the ecliptic, but almost bisected by the equinoctial. It is considered to represent the figure of a man with a sword hanging from his belt. The principal stars are four forming a large quadrilateral, representing the right and left shoulders, right knee, and left foot, and three in a slanting line representing the belt. The three stars forming the sword are beneath the belt. The middle star in the sword is a multiple star, surrounded by the Great Nebula (see *Nebula*). Orion is considered to be the grandest of the constellations. It is referred to by Homer, and also in *Job* and *Amos*.

Orissa, a former Hindu kingdom, now forming the southern portion of the province of Behar and Orissa (q.v.), and comprising the division of Orissa (area, 13,743 sq. miles; pop. 5,250,000) and the tributary states (all Oriya-speaking: area, 28,046 sq. miles; pop. 3,250,000). The tributary states do not form a part of British India, and are self-controlling under the guidance of a Resident. See *Bengal*; *India.*

Oristano, a city of Sardinia, on the west coast (Gulf of Oristano), with a steamer and railway service to other points on the coast, and a trade in fish, wheat, and wine. Pop. 7000.

Orizaba, a city of Mexico, state of Vera Cruz, on the railway to Mexico City. It stands in a valley at an altitude of 3975 feet, and is one of the most important Mexican cotton-mill cities. There are breweries and a large jute factory. Pop. 35,260.

Orizaba, Pico de, an extinct volcanic mountain peak of Mexico, known to the Aztecs as Citlaltepetl or Star Mountain, lying within 26 miles north of Orizaba City. It was first ascended in 1848, and last erupted in 1566. Altitude, 18,300 feet.

Orkney Islands (the ancient **Orcădes**), a group lying off the northern coast of Scotland, and separated from it by a channel called the Pentland Firth, about 6 to 8 miles broad; aggregate area, 375 sq. miles. There are about ninety islands and islets, but only twenty-nine are inhabited. Pomona or Mainland is the largest of the group; others of considerable size are: Hoy, South and North Ronaldshay, Westray, Sanday, Eday, Stronsay, Rousay, and Shapinshay. Scapa Flow, the base of the Imperial Grand Fleet during the European War (1914–18), is bounded by Pomona, Hoy, and South Ronaldshay. Excepting Hoy, none of the islands have hills of any height; there are no large streams, but many lakes and springs. Trees scarcely exist. The rocks belong to the Old Red Sandstone formation, and clay and peat-moss abound. The climate is moist but not cold, being remarkably mild in winter. Agriculture, pasturing, and fishing are the supports of the inhabitants, manufactures being restricted to hosiery, chiefly hand-made by women. The fisheries are vigorously prosecuted. Agriculture is not in a flourishing condition, and the crofters of the islands were included in the Crofters' Act of 1886. The chief town is Kirkwall.

It is probable that the Picts originally possessed the islands, but in the eighth century and subsequently they were occupied by the Northmen. In the ninth century Harold Haarfager attached them to Norway, and for several centuries they were ruled by jarls or earls, who sometimes owned allegiance to Norway, sometimes to Scotland. About the middle of the thirteenth century they were transferred to Alexander III, King of Scotland; but the Norwegians continued to assert their sovereignty. James III of Scotland received the islands as a dowry with Margaret of Norway in 1468, and ever since they have belonged to Scotland. Many Norse customs and Scandinavian expressions of speech still persist in the Orkneys, and there is a tradition that the islands will one day be reunited to Norway. The Orkney Islands form together one county, but for parliamentary purposes unite with Shetland to return one member to the House of Commons. Pop. (1921), 24,109.

Orlando, Vittorio Emmanuele, Italian diplomat and jurist, was born at Palermo in 1860. In 1883 he became a professor of constitutional law in his native city, and eventually he entered the Italian Parliament (1898) as Deputy for Partinico, Sicily. He accepted the portfolio of Public Instruction in the Giolitti-Tittoni Cabinet (1903–5), and that of Justice under Giolitti (1907–9) and Salandra (March, 1914). In 1916, when Salandra resigned and Boselli became Prime Minister, Orlando retained the ministry of the Interior, and by his weakness and indecision was largely to blame for the shambles of Caporetto. In Oct., 1917, he succeeded Boselli as Prime Minister, and to him was largely due the *moral* of Italy during a time of acute distress and danger. Orlando was one of the 'Big Four' at the Peace Conference of Versailles (1919), but his ministry fell in June of that year on account of the Fiume crisis. On 3rd Dec., 1919, he was elected President of the Chamber, and in Oct., 1920, he became Ambassador to Brazil.

Orléanais (or-lā-à-nā), one of the pre-Revolutionary provinces of France. It now forms the departments of Loir-et-Cher and Loiret, and parts of Eure-et-Loir, Nièvre, Seine-et-Oise, Sarthe, Indre-et-Loire, and Cher. Orléans was the capital.

Orléans, House of, French royal family, two branches of which, the Valois-Orléans and the Bourbon-Orléans, occupied the throne of France. The first duc d'Orléans was Philip, fourth son of Philip VI (1344–75), and the second was Louis I (1372–1407), comte de Valois, and a brother of Charles VI. In 1498, on the death of Charles VIII, Louis, duc d'Orléans, a son of the poet Charles of Orléans, became king under the title of Louis XII. The last sovereign of this branch, the Valois-Orléans, was Henri III (died 1589). The second branch of the House of Orléans, that of Bourbon-Orléans, is descended from Philip, duc d'Orléans, son of Louis XIII, and a younger brother of Louis XIV. His son Philip, duc d'Orléans, was Regent of France during the minority of Louis XV. The title passed to the descendants of the duke, one of whom, Louis Philippe, duc de Chartres, became King of France in 1830. The grandson of Louis Philippe (q.v.), the comte de Paris (1838–94), became head of the royal house and royalist party, leaving a son, the duc d'Orléans, to inherit his claims.

Orléans, Jean Baptiste Gaston, Duc d', third son of Henry IV of France and Mary of Medici, born 1608, died at Blois 1660. Louis XIII was jealous of the duke, who was constantly intriguing against the king and the Government of Richelieu. By his first marriage, with Mary of Bourbon, heiress of the House of Montpensier, he had a daughter, the author of some interesting memoirs. During the disturbances of the Fronde he joined De Retz, the soul of the Fronde, who, however, soon saw through the character of his fickle and feeble confederate. After the termination of the troubles (1648) the duke was banished to Blois.

Orléans, Louis Philippe Joseph, Duc d', better known as *Philippe Égalité*, a cousin of Louis XVI and great-grandson of the Regent Philippe. He was born at St. Cloud 13th April, 1747, and died 6th Nov., 1793. In 1769 he married the daughter of the duc de Penthièvre. He was notorious for his dissoluteness of manners, and the extreme, though vacillating political conduct by which he courted popularity. His opposition to the court began in 1771, and he became the rallying-point of its enemies. In 1787 he was exiled for the part he took in the Assembly of Notables; in 1789 he was one of the nobles who joined the Tiers État (Third Estate); in 1792 he went over to the revolutionary party without reserve, took the name of *Philippe Égalité* ('Philip Equality'), and voted for the death of Louis XVI. It did not save him from being arrested as a Bourbon, condemned, and beheaded.

Orléans, Philippe, Duc d', son of Louis XIII and of Anne of Austria, and the only brother of Louis XIV of France, was born in 1640, and died in 1701. He was the founder of the House of Bourbon-Orléans, which for a short time held the throne of France. In his twenty-first year he married Henrietta of England, sister of Charles II. The great esteem which the king showed for this princess excited the jealousy of his brother, and her sudden death was attributed to poison, to the administration of which the duke was suspected of being accessory. The second marriage of the duke, with the Princess Elizabeth of Bavaria (1671), was arranged by Louis to secure the neutrality of the Elector Palatine in the approaching war against Holland. In this war the duke distinguished himself in spite of his effeminacy.

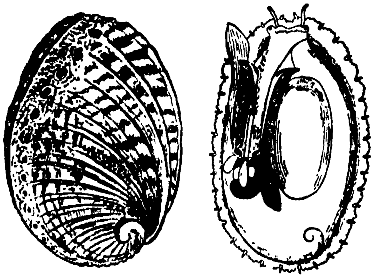
Orléans, Philippe, Duc d', Regent of France, son of Philippe, duc d'Orléans, and the Princess Palatine Elizabeth, born 1674, died 1723. He fell early under the influence of the clever and unscrupulous Abbé (afterwards Cardinal) Dubois, who continued his confidant and adviser through life. He made his military début at the siege of Mons (1691), and in 1693 distinguished himself at Neerwinden, but only to arouse the jealousy of Louis XIV, his uncle, who compelled him to retire from the army. In 1692 he married Mlle de Blois, the legitimated daughter of Louis. In 1707 he was appointed to succeed the Duke of Berwick in Spain, and completed the subjugation of that country. He was recalled, however, being suspected of intriguing for the crown of Spain, and again forced into retirement. On the death of the king (1st Sept., 1715) he was appointed regent. On acceding to power the regent found the finances in extreme disorder, and endeavoured to improve matters by retrenchment and peace; but his reckless introduction of a vast paper currency brought the nation to the verge of bankruptcy. He resigned the government to Louis XV on 13th Feb., 1723.

Orléans (ancient **Genabum**, Lat. *Civitas Aureliani*), a city of France, formerly capital of Orléanais, now of the department of the Loiret, on the Loire. It has a Gothic cathedral, destroyed by the Huguenots in 1567, and rebuilt from 1601 onwards; two hôtels de ville, a palais de justice, and other notable buildings. The manufactures include cotton, linen goods, pottery, refined sugar, and vinegar. Philip of Valois erected Orléans into a duchy and peerage in favour of his son, and Orléans has since continued to give the title of duke to a prince of the blood-royal. In 1428 the city sustained a siege against the English, and was relieved by the Maid of Orléans (*Joan of Arc*), whose statue in bronze, erected in 1855, stands in the Place du Martroi. The city was taken and retaken more than once in the Franco-German War in the latter part of 1870. Pop. 72,000.

Orlov, a Russian noble family, of whom the following members may be mentioned:—Gregory Orlov, born 1734, died 1783, assisted the Grand-Princess Catherine in the Revolution, by which she was declared empress (Catherine II), and her husband, the Emperor Peter III, deprived of life. Orlov soon attained the highest dignities and became enormously rich.—Alexis, his brother, born 1737, died 1808, is famous for his devotion to the empress, as one of the murderers of Peter III, and as the admiral who defeated the Turkish fleet off Tschesme.

Orlov, Alexis Fedorovitsh, Prince, a descendant of the above family, born in 1787, died 1861. In 1825 he gained the favour of Nicholas I by assisting to suppress the revolt of the guards on his accession. He held a cavalry command in the Turkish campaign of 1828, and assisted in suppressing the Polish insurrection in 1831; he also rendered successful diplomatic service, especially at Constantinople. In 1844 he was appointed chief of the gendarmes and secret police. He was the confidential friend of the emperor.

Ormer (Fr. *oreille de mer*, 'sea-ear'), the ear-shell, a large marine univalve shell-fish belonging to the genus Haliŏtis, common on the shores of the Channel Islands, where it is cooked after being well beaten to make it tender. The shell is common as a mantelpiece ornament on account of its pearly interior.



Ormer (*Haliŏtis*)

Exterior of shell and diagrammatic view of interior

Orme's Head, Great, a bold, flat-topped headland of Carnarvonshire, North Wales, at the mouth of the River Conway, reached by a funicular railway. The fashionable watering-place of Llandudno is situated between the Great and Little Orme's Heads.

Or′molu (Fr. *or moulu*, literally 'ground gold') is in English frequently applied to a metal compounded of copper and zinc (mosaic gold), nearly resembling brass, but having a colour more like that of gold. In French *or moulu* signifies a paste of gold and mercury used for gilding, and the colour imparted to a surface by that paste.

Ormskirk, an urban district and town of Lancashire, England; served by the Lancashire & Yorkshire Railway. Its chief occupations are brewing and rope-making, and there are large collieries. Ormskirk is noted for its gingerbread. Pop. 7407.

Ormuz, an island opposite Bandar 'Abbâs, on the Strait of Ormuz, connecting the Persian Gulf with the Gulf of Oman. It was the site of one of the wealthiest commercial cities of the East, which was founded in the third century, and occupied originally the mainland on the north side of the strait. In A.D. 1300 a new city was built on the Island of Ormuz on account of Mongol depredations. This was taken by the Portuguese in 1507, and was held by them until besieged and captured by the British in 1622, when Bandar 'Abbâs and Gombroon were founded, and the city was allowed thenceforth to fall into decay. In the island there are large deposits of red ochre, thousands of tons of which are exported annually to the United Kingdom. The climate is hot; the wet season begins in January and ends in March.

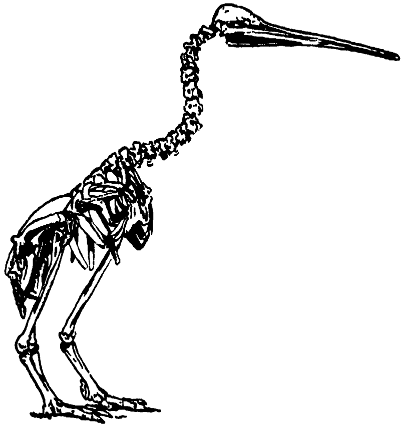
Ormuzd, or **Ormazd** (*Ahuramazda*, the Oromasdes of the Greeks and Romans), the Supreme Being in the Zoroastrian religion. He is represented in the *Avesta* as the sovereign of the realm of good, light, and truth, the lord of the universe, and the creator of earthly and spiritual life. He rewards the good and punishes the wicked. As the principle of good Ormuzd is opposed to Ahriman, the lord of the bad creation. Ormuzd is not self-existent, but has sprung from Zarvan-Akarana (infinite and uncreated time). He contains within himself the opposite principles of good and evil, which were afterwards separated by the Magi into distinct individualities. As a deity Ormuzd approaches the Judæo-Christian conception of Jehovah; and like the latter is omniscient and omnipotent, the One Who was, Who is, and Who shall be.—Cf. J. H. Moulton, *Early Zoroastrianism.*

Ornaments. In ancient times these were worn as charms and amulets. The Cro-Magnon men of the post-Glacial epoch, who lived in Italy and South-Western Europe as contemporaries of the reindeer and hairy mammoth, decorated their dead with sea-shells, ivory tablets, animals' teeth, and spines of fish. In the Grimaldi caves, near Mentone, green pebbles are sometimes found between the teeth of the dead. From an early period the ancient Egyptians decorated their dead with shell and other ornaments, and the earliest gold ornaments found are models of shells. In Egypt, China, and Mexico green stones placed in the mouth of the dead were supposed to contain 'life substance' and to vitalize the heart, the seat of life. The lore of precious stones, which is considerable, shows that these were worn or accumulated as sacred objects. Buddhists accumulate ornaments, including gems, coral, gold, &c., to increase their stock of religious merit. The ancient Celts threw gold and silver into their sacred lakes. In China jade ornaments were supposed to charm the living and the dead. The investigation of ornament symbolism in various parts of the world reveals the fact that ornaments had originally a magico-religious value.

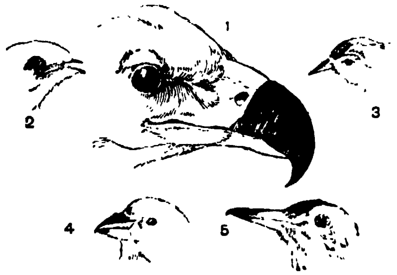
Orne, an inland department of North-Western France, drained by the Orne, Eure, Sarthe, and other rivers, and traversed generally by ridges of low hills. It is noted for horses and for dairy produce (including Camembert cheese). Cattle are raised; cereals include wheat and barley; the hills are afforested; much fruit is grown. Alençon, the capital, and the towns of Laigle, Argentan, Flers, and Domfront are all served by the Western Railways. About a half of Orne belonged to pre-Revolutionary Normandy—the rest to the Duchy of Alençon and to Perche. Area, 2371 sq. miles; pop. (1921), 274,814.

Orne, a river of France, rising near Sées, in the department of Orne, passing through Calvados, and falling into the English Channel; length, 95 miles. It is canalized from Caen to its mouth.

Ornithology (Gr. *ornis*, *ornithos*, a bird; *logos*, a discourse), the study of birds. These vertebrate animals constitute a sharply defined class (Aves), and can be briefly defined as feathered bipeds with the fore-limbs converted into wings, which are usually but not always employed for flight. They are undoubtedly of reptilian stock, and the term Sauropsida is often applied to birds and reptiles collectively. The form and structure of birds have been evolved

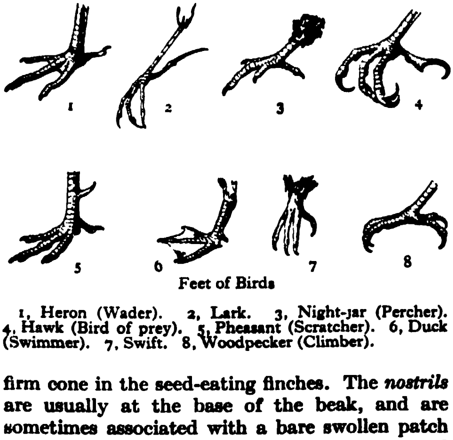

Skeleton of Apteryx

in relation to flight. The bony skeleton, for example, though firm is light, being largely traversed by air-spaces. The framework of the compact trunk is rigid, but as a compensation the neck is extremely flexible, and the head can be moved about with great freedom, for there is only a single occipital condyle articulating with the first vertebra. The back of the head is large and rounded, for the brain is well developed, a character correlated with marked intelligence. The mouth is bounded by a *beak* or *bill*, devoid of teeth (except in some extinct types), but covered by a firm horny sheath. The shape of the beak is related to the habits, and presents a great range of variation, it being, e.g., hooked in a bird of prey, elongated and slender in the woodcock which probes for its food, and a short firm cone in the seed-eating finches. The *nostrils* are usually at the base of the beak, and are sometimes associated with a bare swollen patch of skin, the *cere*. The eyes are large, and provided with translucent third eyelids or nictitating membranes, which can be moved with great rapidity. There are no external ears. The wings possess the same regions as ordinary fore-limbs, i.e. upper arm, forearm, and hand, but there are only three digits, one of these being the thumb. Since the chief use of the wing is to support the *wing-quills* or *rowing feathers* (remiges), its skeleton is firm, as the result of the fusion of certain bones. The remiges are divided into primaries and secondaries, attached respectively to hand and forearm. Their bases are overlapped by *wing coverts*. The thumb ends in a small claw and bears a tuft of feathers, the *bastard wing* (ala spuria), that probably helps in turning movements. The tail is reduced to a sort of stump, and its vertebræ are usually fused into a laterally flattened *ploughshare bone* (pygostyle), for supporting the *tail-quills* or *steering feathers* (rectrices), the bases of which are overlapped by *tail coverts*. An *oil-gland* usually opens on the upper side of the tail, its secretion being used for preening feathers. The hind-limbs are set on far forwards, each consisting of thigh, shank, tarsus, and foot. The shank is equivalent to a lower leg fused with the upper part of the ankle, while the 'tarsus' consists of the lower part of the ankle fused with three of the instep bones (metatarsals). It follows that the ankle-joint at the junction of shank and tarsus is *intertarsal*, i.e. in the middle of the ankle region. The bird is digitigrade, walking on its toes, of which the normal number is four, a backwardly directed great toe (hallux), and forwardly directed second, third, and fourth toes. Tarsus and foot are covered with scales, a reptilian feature, and the toes are clawed. The length of the hind-limb and the nature of the foot vary greatly with the habits. Birds of prey, for example, possess powerful grasping feet armed with talons; climbing forms, such as parrots, commonly have the fourth toe directed backwards like the hallux; aquatic birds are mostly web-footed.



Beaks of Birds

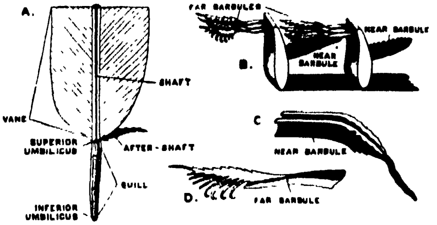
1, Vulture 2, Swift. 3, Wren. 4, Greenfinch. 5, Thrush.



Feet of Birds

1, Heron (Wader). 2, Lark. 3, Night-jar (Percher). 4, Hawk (Bird of prey). 5, Pheasant (Scratcher). 6, Duck (Swimmer). 7, Swift. 8, Woodpecker (Climber).

The *external skeleton* consists of the horny sheaths covering the jaws, the claws, the scales above-mentioned, and various kinds of feathers, all being of epidermal origin. A typical *feather* consists of a basal hollow *quill* continued into an elastic *rachis*, the axis of the expanded *vane*, and bearing flattened *barbs*. These last bear smaller branches, *barbules*, connected by minute hooks, so as to form a firm light expansion for beating on the air. There may be a second, usually smaller, vane at the base of the first; the barbules of this 'after shaft' do not bear hooks. In addition to quill-feathers and coverts there are numerous *contour-feathers*, of similar structure, which determine the general outline of the body. They do not cover the entire surface, but are arranged in definite tracts (pterylæ), which vary in different species and are some aid to classification. The intervening patches (apteria) are to some extent bare, but imperfect *down-feathers* and also hair-like *filo-plumes* may be found growing upon them. This characteristic covering of feathers entangles air and helps to prevent loss of heat from the surface of the body. Feathers are of a great variety of colours, mostly due to the presence of pigments, but the metallic iridescent appearance seen in such forms as humming birds is of physical character, and depends on the presence of microscopic ridges that act like prisms. Male birds are as a rule more brilliantly coloured than their mates, and may possess other secondary sexual characters. Female birds are usually coloured and marked so as to harmonize with their surroundings, a measure of protection from foes being thus gained. Feathers are shed or moulted once or twice in the year, and there may be a marked contrast between summer and winter plumage.



Structure of a Feather

A, Base of quill feather. B, Barbs and barbules (enlarged). C and D, Separate barbules (still further enlarged)

Digestive Organs.—Not only the beak but also the *tongue* exhibits many variations in form. When used for securing insects, as in woodpeckers, it is often rendered sticky by the secretion of special glands. The gullet commonly dilates into a *crop* for storing food, especially in plant-eaters, and the *stomach* consists of a glandular *proventriculus*, in which gastric juice is secreted, followed by a muscular *gizzard* with a horny lining. This serves as a grinding apparatus, and small hard bodies, such as stones, are swallowed for the purpose of increasing its efficiency. The intestine opens into a cloaca.

Blood System.—The blood is hotter than in Mammals, varying from 103° F. to 110° F. The red corpuscles are oval nucleated discs. The heart consists of two auricles and two ventricles, and the arch of the aorta turns to the right, whereas in Mammals it turns to the left.

Respiratory Organs.—The immobile *lungs* are firmly attached to the dorsal wall of the thorax, and are connected with numerous *air sacs*, that communicate with air-spaces in the bones. This greatly reduces the specific gravity of the body. The organ of voice (syrinx) is situated where the trachea divides into bronchi.

Urinogenital Organs.—These communicate with a cloaca, which also receives the intestine. There is no urinary bladder, and the urine is semisolid. The organs of generation are internal: only one ovary and oviduct are present; the large eggs are invested in firm calcareous shells.

Muscular System. — In a flying bird the flesh of the well developed breast is made up of muscles that depress and raise the wings in flight. These are attached to a large plate or *keel* that projects from the breast-bone (sternum). In running birds, such as ostriches, that do not fly though they possess small wings, the breast-bone is a broad curved plate devoid of keel. Birds that live and roost among trees or shrubs possess a *perching mechanism*, an arrangement by which the toes can be all brought together at the same time by a pull exerted upon a single tendon connected with two muscles of the legs. When the bird is roosting, the weight of the body bends the limb in such a way as to pull on this tendon and bring all the toes firmly against the branch or other supporting object, the danger of falling off during sleep being thus averted.

Nervous System and Sense Organs.—The cerebral hemispheres of the brain are large, in relation to the possession of considerable intelligence, and the sense organs are well developed. Part of the internal ear (membranous labyrinth) consists of a slightly curved tube (lagena) that has to do with the appreciation of musical sounds.

Habits.—Nesting and migration are the two most interesting. A few birds, such as the Megapodes of New Guinea and North-East Australia simply lay their eggs in hot sand or decaying vegetation, where they hatch out without any further attention. But incubation takes place in the vast majority of cases, the necessary heat being supplied by the body of the parent or parents. Some birds, such as guillemots, do not construct nests, but usually some sort of receptacle is made for the reception of the eggs, and this may be of very elaborate character. When eggs are exposed to view they are generally coloured and marked to harmonize with surroundings, and this is commonly true of newly hatched young in cases where these run from the nest and are not helpless nestlings. Cuckoos and a few other forms deposit their eggs in the nests of other species.

Nesting habits are undoubtedly instinctive; this is also true for the habit of migration, regarding which a vast number of facts are known. In this country four cases can be distinguished: (1) *winter visitors* which fly north in spring to their breeding quarters; (2) *summer visitors* that come from the south to breed here; (3) *birds of passage* that appear for a short time in spring and autumn, resting on their way to and from their breeding quarters in the north; (4) *gipsy migrants*, that wander from one part of the country to another, apparently in search of food. Migrating birds are known to take definite routes, some of which correspond to vanished land surfaces, but how they find their way is an unsolved problem.

Classification.—This is a matter of extreme difficulty, and a large number of systems have been advanced. The following embodies the views most generally favoured.

Sub-class I: Archæornithes. Includes only the extinct Archæopteryx, a Jurassic toothed form about the size of a rook. The tail was long and bore pairs of quill-feathers.

Sub-class II: Neornithes. Tail abbreviated. Division A: Ratitæ. Flightless running birds, with no keel to the sternum and reduced wings. Here are included ostriches, rheas or South American ostriches, cassowaries, emeus, and the little New Zealand kiwi (Apteryx): also extinct types—some gigantic—the New Zealand moas (Dinornis, &c.), and the roc (Æpyornis) of Madagascar. Division B: Odontolcæ. A few extinct toothed birds from the Cretaceous (Hesperornis, &c.), with reduced wings and keelless sternum. Division C: Carinatæ. Wings usually well developed, and sternum with keel for attachment of muscles of flight. Most birds belong to this division, which is divided into fourteen orders of very unequal size.

1. *Ichthyornithes.* Small extinct birds (Ichthyornis, &c.) of the Cretaceous period, possessing teeth in sockets, and well-marked powers of flight.

2. *Colymbiformes.* Aquatic birds with webbed or lobed toes, the hallux being very small. The divers (Colymbidæ) have webbed feet, and the grebes (Podicipedidæ) lobed toes.

3. *Sphenisciformes.* Penguins (Spheniscidæ), with webbed feet, and wings converted into paddles.

4. *Procellariiformes.* Oceanic birds with great powers of flight, webbed feet, hooked beak, and nostrils drawn out into a pair of bony tubes. Albatross, fulmars, shearwaters, and petrels (Procellariidæ).

5. *Ciconiiformes.* A large assemblage of birds that are for the most part aquatic. Four sub-orders: (*a*) Steganopodes. Marine web-footed forms with the hallux turned forwards, and united by a membrane with the other toes. Tropic birds (Phæthontidæ), gannets and boobies (Sulidæ), cormorants and snake-birds (Phalacrocoracidæ), frigate-birds (Fregatidæ), pelicans (Pelicanidæ). (*b*) Ardeæ. Long sharp beak, elongated legs, web between bases of middle and outer toe. Herons and bitterns (Ardeidæ), hammer-heads (Scopidæ). (*c*) Ciconeæ. Long necks and legs, feet partially webbed, beak stout. Storks (Ciconiidæ), ibises and spoonbills (Ibididæ). (*d*) Phœnicopteri. Much elongated neck and legs, webbed feet, beak very large and sharply bent downwards. Flamingoes (Phœnicopteridæ).

6. *Anseriformes.* Aquatic birds mostly feeding on plants. Horned screamers, &c. (Palamedeidæ) of South America; feet not webbed. Swans, geese, and ducks (Anatidæ), with webbed feet.

7. *Falconiformes.* Diurnal birds of prey. Strong hooked beak with cere at base; carnivorous; strong flyers. Vultures, carrion feeders, with head and neck more or less bare of feathers; American vultures (Cathartidæ), including the gigantic condor (*Sarcorhamphus gryphus*); Old World vultures (Vulturidæ); secretary birds (Serpentariidæ) of Africa; eagles, hawks, falcons, buzzards, kites, &c. (Falconidæ); ospreys (Pandionidæ).

8. *Tinamiformes.* The tinamous, of South America, resembling game-birds in appearance, but of more primitive character.

9. *Galliformes.* Game-birds. Mostly ground forms with stout beak and short strong legs with blunt claws, adapted for scratching. Hemipodes or button-quails (Turnicidæ); megapodes or mound-builders (Megapodiidæ); curassows and guans (Cracidæ); Guinea-fowl, turkeys, pheasants, partridges, grouse, pea-fowl, jungle fowl, &c. (Phasianidæ); hoatzins of South America (Opisthocomidæ).

10. *Gruiformes.* Marsh-dwelling crane-like birds; hind toe raised well above the ground. Rails (Rallidæ); cranes (Gruidæ); trumpeters (Psophidæ); crested screamers, &c. (Cariamidæ); bustards (Otididæ).

11. *Charadriiformes.* (*a*) Limicolæ. Plovers, stilts, phalaropes, sand-pipers, curlews, woodcock, and snipe (Charadriidæ); pratincoles and coursers (Glareolidæ); stone curlews (Œdicnemidæ); jaçanas (Parridæ). (*b*) Lari. Gulls terns, and skuas (Laridæ). (*c*) Alcæ. Auks (Alcidæ). (*d*) Pterocles. Sand grouse (Pteroclidæ). (*e*) Columbæ. Extinct dodo and solitaire (Dididæ); tooth-billed pigeons (Didunculidæ); pigeons and doves (Columbidæ).

12. *Cuculiformes.* Two toes turned backwards. (*a*) Cuculi. Cuckoos (Cuculidæ); plantain-eaters (Musophagidæ). (*b*) Psittaci. Parrots, parakeets, macaws, and cockatoos (Psittacidæ); lories, kaka and kea parrots of New Zealand; (Trichoglossidæ).

13. *Coraciiformes.* (*a*) Coraciæ. Rollers (Coraciidæ), motmots and todies (Momotidæ), kingfishers (Alcedinidæ), bee-eaters (Meropidæ), hornbills (Bucerotidæ), hoopoes (Upupidæ). (*b*) Striges. Owls (Strigidæ). (*c*) Caprimulgi. Nightjars or goatsuckers (Caprimulgidæ), frogmouths (Podargidæ), oil-birds (Steatornithidæ).

(*d*) Cypseli. Swifts (Cypselidæ), humming-birds (Trochilidæ). (*e*) Colii. Colies or mouse-birds (Coliidæ). (*f*) Trogones. Trogons (Trogonidæ). (*g*) Pici. Jacamars and puff-birds (Galbulidæ), barbets and honey-guides (Capitonidæ), toucans (Rhamphastidæ), woodpeckers and wrynecks (Picidæ).

14. *Passeriformes.* Here are included the perching or insessorial birds, some 5500 species, more than half the number of known forms. They embrace all the small singing birds, among others. Classification is difficult, depending as it does on anatomical details, especially those concerning the small muscles attached to the organ of voice (syrinx). Over fifty families are recognized, of which the following are among the more familiar: larks (Alaudidæ), wagtails and pipits (Motacillidæ), thrushes and warblers (Turdidæ), swallows and martins (Hirundinidæ), tits (Paridæ), birds-of-paradise (Paradiseidæ), crows and their allies (Corvidæ), finches and buntings (Fringillidæ).

See numerous articles on groups and individual species contained in this work.

BIBLIOGRAPHY: A. H. Evans, *Birds* (Cambridge Natural History); R. Lydekker, *Royal Natural History* (vols. iii and iv); J. R. Ainsworth-Davis, *Natural History of Animals*; Alfred Newton, *A Dictionary of Birds*; Hans Gadow, *A Classification of Vertebrata*; F. G. Aflalo, *Natural History* (Vertebrates) *of the British Isles*; Elliott Coues, *Field and General Ornithology.*

Ornithorhynchus (*Ornithorhynchus anatinus*), the duck-bill or duck-billed platypus of Southern and Eastern Australia and Tasmania. With the echidnas or porcupine ant-eaters of Australia and New Guinea it forms the order Monotremata—the lowest division of the mammalia. This curious animal has the shape and size of a small otter, covered with short brown fur; a horny flat bill like a duck; a short flat tail; short legs with five-toed and webbed feet, terminated by claws. The eyes are small; external ear wholly wanting. The skull is bird-like in conformation; brain of low type; coracoid bones as in reptiles well developed. Small grinding teeth are at first present, but are ultimately replaced by horny plates. Its young are produced from eggs, are born blind and hairless, and suckled from milk-glands destitute of nipples, which open into a temporary pouch. It forms large burrows in river and lake banks, rising from near the surface of the water to a height of perhaps twenty feet above it, the nest being at the higher end. It swims for its food, which consists of bivalve molluscs, insects, worms, larvæ, &c.

Ornithorhynchus

Orobanchaceæ (-ban-kā'si-ē), the broom-rape family of plants. They are herbaceous parasites, with scales in place of leaves, and attach themselves to the roots of different plants, as the *Orobanche major* to broom and furze, *O. ramōsa* to hemp, *O. rubra* to thyme, and *O. hedĕræ* to ivy.

Oro'sius, a Latin historian, born probably at Bracara (Braga), in Portugal, about A.D. 390. He became a Christian presbyter, resided a considerable time with St. Augustine at Hippo, and wrote at his suggestion a general history of the world (*Historiarum Libri vii adversus Paganos*), to prove that the Christians were not to blame for the downfall of the Roman Empire as the heathen alleged. It is a worthless compilation, but for long enjoyed a great popularity, and was translated into Old English by King Alfred with modifications and additions.

Orota'va, a town of the Canary Islands, in the north-west of the Island of Teneriffe. It exports quantities of fruit, wine, and cochineal, and is a health-resort. Pop. about 10,000.

Orphan Asylum, or **Orphanage**, an establishment in which orphans are provided for and educated. In all well-regulated states the duty of taking care of destitute orphans was recognized, and it appears that the cities of Thebes, Athens, and Rome had establishments in which orphaned, deserted, and illegitimate children were supported and educated at the public expense. In the laws of the Emperor Justinian there is frequent mention of such institutions. In the Middle Ages such asylums were numerous and generally under the direction of the clergy. In recent times public orphanages have been substituted or supplemented by the farming-out system, that is, the children are brought up in private families willing to undertake their charge. This system, with due care in the selection of guardians and judicious supervision, has proved satisfactory wherever it has been tried. Orphans in Britain are dealt with under the poor-law, and orphan asylums proper, chiefly private foundations, are limited in number.

Orpheus (or'fūs), in Greek mythology, one of the most famous of Greek legendary singers, the chief representative of the art of song. He is also represented as the founder of a religious sect. He is not mentioned in Homer and Hesiod, but appears in the lyric period, and becomes surrounded by a multitude of celebrated legends. According to a later development of the story of Orpheus, he was the son of Œagrus and the Muse Calliope. To him is attributed the application of music to the worship of the gods. Apollo presented him with his lyre, and the Muses instructed him to use it, so that he moved not the beasts only, but the woods and rocks with its melody. Having lost his wife Eurydice by the bite of a serpent, he descended to Hades to try and get her back. His music so moved the infernal deities Pluto and Persephone that they allowed her to return to earth, on condition that her husband, whom she was to follow, would not look back till they had reached the upper world. This condition the impatient Orpheus violated and lost his wife for ever. He is said to have met his death at the hands of a band of furious Thracian women engaged in the mystic rites of Bacchus, and whose advances he had rejected. He is represented as one of the Argonauts, and to him is ascribed the origin of the so-called Orphic mysteries connected with the worship of Bacchus.—BIBLIOGRAPHY: J. E. Harrison, *Prolegomena to the Study of Greek Religion*; C. A. Lobeck, *Aglaophamus*.

Orphism. From the sixth century a mass of religious literature was attributed to Orpheus, and Orphic sects or societies were formed all over Greece.

These societies practised a mystical worship, attached to no particular temple, and promulgated their views in literary works. Their devotions were addressed to Dionysus Zagreus, in whom they idealized the conception of intense sorrow for human misery. He was a lower-world deity, who was to purify the soul and make it immortal. Instead of indulging in the enthusiasm and orgies of the Bacchic worship, the members of the Orphic societies practised an ascetic purity of life and conduct. The sacrificial rite consisted in partaking of raw flesh torn from the bull of Dionysus, and those who had participated in it afterwards ate no other animal food. The earliest authors who expounded their doctrines were Pherecydes and Onomacritus. One sect of them held a doctrine curiously like that of indulgences. They offered by sacrifices and songs to procure for the rich pardon for their own sins and for those of their ancestors. The soul, according to Orphic teaching, was immortal. After death it passed to Hades, where it was either rewarded or punished, and reborn again in man or animal. The transmigration of the soul was, however, not eternal, as through pure living a soul would safely pass through the danger of the Nether World. When it had been acquitted of guilt three times, it was free and then passed to the Islands of the Blest. The bulk of the poems attributed to Orpheus have been proved to be forgeries of Christian grammarians of the Alexandrian school. A portion of them, however, belong to the time of Onomacritus, or earlier, and include hymns, a theogony, a poem called *Minyas*, or the *Descent into Hades*; oracles and songs for initiation, and sacred legends.—BIBLIOGRAPHY: C. A. Lobeck, *Aglaophamus*; S. Reinach, *Cultes, Mythes et Réligions*.

Or'piment, a mineral consisting of arsenic and sulphur (As_2S_3), of a bright-yellow colour, passing into golden; specific gravity, 3·5. It occurs in laminated or lamellar masses, monoclinic in concretions, and more rarely in crystals.

Orpington Fowl. See *Poultry*.

Orris Root, or **Iris Root,** the root of several species of Iris, especially of the *I. florentina*, which on account of its violet-like smell is employed in perfumery and in the manufacture of tooth-powder. It is also used in pharmacy as a pectoral.

Orsi'ni, one of the most illustrious and powerful families of Italy. It became known about the eleventh century, and had already acquired high rank and extensive possessions in the Papal States when one of its members, Giovanni Gaetano, was raised to the pontificate under the title of Nicholas III (1277–80). The feud between the Orsini and Colonna families, celebrated in history, commenced towards the close of the thirteenth century. It is distinguished for bitterness, unscrupulousness, and violence, assassination being not unfrequently resorted to. Many of the Orsini became famous military chiefs. Vincenzo Marco Orsini (Benedict XIII) succeeded Innocent XIII as Pope in 1724. The Orsini family is now divided into two branches, the Orsini-Gravina at Rome and the Orsini of Piedmont.

Orsini, Felice, Count, Italian revolutionist, born in 1819, died 13th March, 1858. In 1838 he was sent to study law at the University of Bologna, and joined the Society of Young Italy, formed in 1831 by Mazzini. In 1843 he took an active part in an insurrection, was arrested, and sentenced to the galleys for life. Liberated on 16th July, 1846, under the amnesty of Pope Pius IX, he afterwards went to London, where he wrote his work *Austrian Dungeons in Italy* (1856), and lived by giving lectures on his adventures. In concert with three Italian refugees, Rudio, Gomez, and Pieri, he planned the assassination of Napoleon III, but the attempt, made on 14th Jan., 1858, when Orsini threw a bomb at the emperor, failed. Orsini was arrested and executed.

Or'thite, a hydrous silicate of aluminium containing the rare metals cerium, lanthanum, didymium, and yttrium, occurring in granite and other rocks in Sweden, Greenland, the Urals, &c. It is a species of the epidote series, and is also known as *allanite*.

Ortho'ceras, a genus of fossil cephalopods, having straight or slightly curved chambered shells, allied to the nautilus, and occurring from the Cambrian to the Trias.

Or'thoclase, a silicate of aluminium and potassium, the common felspar of granites, rhyolites, and trachytes. It crystallizes in the monoclinic system, commonly in twinned forms. Transparent crystals are styled *adularia* and *sanidine*. The colour varies from white to yellowish or red; it is opaque, transparent, or translucent; specific gravity, 2·56; hardness, 6, that is, it cannot be scratched by a knife when fresh. Orthoclase breaks down on weathering into kaolin (q.v.).

Or'thodoxy, a term signifying purity of faith, correctness of belief, and a conformity to the rules determined by an ecclesiastical organization. It is the antithesis of heterodoxy. The term, however, is necessarily a relative one, as there are as many different conceptions of orthodoxy as there are Churches. Every Church is apt to consider its doctrines as orthodox, and those of other denominations as heterodox. The standard by which the orthodoxy of religious beliefs is tested is found by Protestants in the Scriptures, whilst Roman Catholics find it in the infallibility of the Pope and the Catholic Church. The Eastern Church, called also the Greek Church, is officially styled The Holy Orthodox Apostolic Eastern Church, just as the Roman is the Catholic Church, the one asserting its orthodoxy, the other its catholicity. On account of its universality and antiquity the Eastern Church indeed claims the exclusive privilege of orthodoxy. It excludes all the additions to the definitions of the first seven œcumenical councils which alone represented the entire Catholic Church. The term orthodoxy may also be applied to opinions and doctrines in general which are currently accepted as correct, whether in the domains of law and literature, art or morality, history, politics, or economics.

Orthographic Projection, that projection used by geographers in the construction of maps in which the eye is supposed to be at an infinite distance from the sphere, so that the rays of light coming from every point of the hemisphere may be considered as parallel to one another. This method of projection is convenient enough for areas not too far from the centre of the picture. See *Map*.

Orthopæ'dia. See *Surgery (Orthopædic)*.

Orthop'tera (Gr. *orthos*, straight, *pteron*, a wing), an order of insects in which the metamorphosis is incomplete. They have four wings, the anterior pair being semi-coriaceous or leathery, usually with numerous nervures, the wings sometimes overlapping and sometimes meeting like the roof of a house. The feelers are generally straight, filiform organs. The limbs vary in conformation according to their methods of movement. There is no resting or pupa stage, and the young insects differ from the adults only in size and the absence of wings. These insects are divided into running (Cursorial) and leaping (Saltatorial) Orthoptera. Of the former division the cockroaches, earwigs, mantis insects, walking-stick insects, and walking leaves form the chief families. The Saltatoria are represented by the locusts, some of which want wings entirely, crickets, and grasshoppers. See also *Entomology*.

Ortler-Spitze, or **Ortler**, a mountain of the Alps, in the Trentino, North Italy, the highest peak of the Eastern Alps; height, 12,814 feet. The group to which this mountain belongs is known as the Ortler Alps, in the chain of the Rhætian Alps. It was first ascended in 1804.

Or'tolan (*Emberiza hortulāna*), a bird of the bunting sub-family, a native of North Africa and Southern Europe. The colours are yellow on the throat and around the eyes, the breast and belly being of reddish hue, whilst the upper part of the body is brown varied with black. Its delicate flesh is much esteemed by epicures, and large quantities are annually caught and fattened for the table in the south of France, Italy, and Cyprus.

Orto'na, a town of Chieti, South Italy, on the Adriatic. It was destroyed by the Turks in 1566. It has a cathedral and a ruined castle. Pop. 16,000.

Ortyx, an American genus of gallinaceous birds allied to the quails and partridges. See *Quail*.

Oru'ro, a western department of Bolivia, on the Chilian, Tacna-Arica frontier, among the Andes, at an average altitude of from 12,000 to 13,000 feet. It contains Lake Poopo. Tin is produced, and llama-wool is exported. Oruro is the capital. Area, 20,657 sq. miles; pop. about 140,000.

Oruro, a town of Bolivia, capital of the department of Oruro, the railway- and mining-centre of the republic, and the Bolivian terminus of the Antofagasta Railway. There is a School of Mines; boots and alcohol are manufactured. Pop. (1918). 31,360.

Orvie'to (ancient **Volsinii**; **Urbibentos**; Lat. *Urbs Vetus*), a city of Perugia, Italy, on an isolated rock near the confluence of the Paglia and the Chiana, ascended by funicular railway. It is noted for a cathedral founded in 1285, and a museum (in the Palazzo dei Papi) dating from 1296, which contains Etruscan antiquities and mediæval works of art. Wine is made and traded. Pop. 19,150.

Orvieto occupies the site of Etruscan *Volsinii*, destroyed by the Romans in 280 B.C. Procopius mentions the city as *Urbibentos*, but it was known as *Urbs Vetus* after his time. It was taken by Belisarius (539), by the Lombards (606), and by Charlemagne, and for long enjoyed possession of a large territory, providing also a safe harbourage for oppressed Popes. The city became a part of Italy in 1860.

Orycter'opus, the generic name of the aardvark or Cape ant-eater (*O. capensis*) of South Africa, an insectivorous edentate mammal.

Oryx, the name of the genus of antelopes represented by the addax (*Oryx nasomaculata*) and by other species, found in large herds chiefly in the northern portions of the African continent, but also in Arabia and Syria. The horns are very long, annulated, and curved backwards. The gemsbok (*Oryx gazella*) of Southern Africa is another species included in this genus.

Osage, a river of the United States, which rises in Kansas, flows through Missouri, and after a winding course of 500 miles joins the Missouri 10 miles below Jefferson City. Drainage area, 15,000 sq. miles.

Osage Orange (*Maclūra aurantiăca*), a tree of the nat. ord. Moraceæ (mulberry), indigenous to North America, where it is frequently used as a hedge-plant. It produces a large yellow fruit of a woody texture, somewhat resembling an orange, but not edible.

Osa'ka, or **Ozaka** (ancient **Naniwa**), an industrial city of Honshu, Japan, on a plain opening to Osaka Bay, and at the mouth of the Aji (Yodogawa). The city is traversed by canals and river branches, and has a harbour for ocean-going steamships. There is a mint (opened 1871), and a castle (founded 1583), within which is an arsenal. Shipyards, cotton-mills, sugar-refineries, and ironworks are representative commercial concerns, and there are markets for rice and cereals, and a stock exchange, &c. Pop. (1920), 1,252,870.

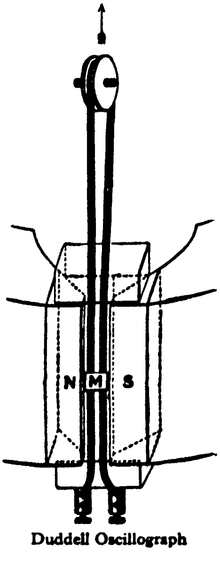
The name Osaka dates from 1492, when it was altered from *Naniwa*. In 1583 the Emperor Hideyoshi made the city his capital, and devoted himself to its improvement. The port was opened to foreign trade in 1868, and the University of Osaka established in 1880.

Osborne House, a favourite residence of Queen Victoria, in the Isle of Wight, 1 mile from East Cowes. The grounds were bought by Queen Victoria in 1845, and the house built by Cubitt. Other residences on the estate are Barton Manor and Osborne Cottage. The estate and house were presented to the nation by Edward VII in 1902, and were turned into a convalescent home for army and navy officers.—*Osborne College*, an institution for training naval cadets, built in the grounds of Osborne House. Opened in Aug., 1903, the college was closed in 1921, the cadets being transferred to the Royal Naval College at Dartmouth.

Oscans (Lat. *Osci*), an Italian people, the earliest-known occupants of Central Italy, subdued by the Sabines. Their language was closely allied to the Latin. Some wall-inscriptions in it have been found in Pompeii. There are no remains of it except on coins and inscriptions.

Oscar I, Joseph François Bernadotte, King of Sweden and Norway, son of Bernadotte (Charles XIV), born at Paris in 1799, died 1859. In 1823 he married Joséphine, eldest daughter of Prince Eugène Beauharnais. During the reign of his father he was three times (in 1824, 1828, and 1833) Viceroy of Norway, where he made himself popular by his good administration. He acceded to the throne in 1844, and encouraged education, agriculture, railways, telegraphs, &c. He resigned in favour of his eldest son, Charles XV, in 1857.

Oscar II, King of Sweden (and for many years also of Norway), born 21st Jan., 1829, died 8th Dec, 1907. He succeeded his brother, Charles XV, in 1872. He showed much sense and dignity in the movement resulting in the separation of Norway from Sweden. Under the pen-name of Oscar Fredrik he wrote historic works of value, and was noted among Swedish lyric poets.



Duddell Oscillograph

Oschersle'ben, a town of Prussia, in Saxony. A junction of the Magdeburg-Halberstadt Railway, it has manufactures of sugar, spirits, and manures. Pop. 13,000.

Oscillatoria, a genus of filamentous Blue-Green Algæ. Several species are common on the margins of pools, on damp walls, in green-houses, &c. The filaments carry out slow swinging or writhing movements, hence the generic name.

Oscillograph, an instrument, the invention of A. E. Blondel and W. Duddell, to record the rapidly changing current and pressure in an alternating-current system. It consists essentially of a pair of strips of phosphor bronze stretched tight in a strong magnetic field, NS, with a mirror, M, attached to them. The current flows up one strip and down the other, causing one to move forward and the other back, and thus turn the mirror through a small angle. The motion of a spot of light, from an arc lamp through lenses, reflected from the mirror would show the wave form on a falling photographic plate. To overcome the necessity for a moving observation device, the light rays are given another motion by reflection from a mirror rocked by a small motor driven off the same electricity-supply. The ray has thus two vibrations imposed upon it at right angles to each other, and a stationary ground glass or photographic plate can be employed. Usually two coils are used, so that the pressure and current can be observed at the same time, and also the angular relation between them. Other methods of investigating these wave forms are due to Jules Joubert, H. L. Callendar, E. Hospitalier, and K. F. Braun.

Osh, a town of Turkestan, in the province of Ferghana, commanding the entrance of the valley leading to the Alai Highlands. There are two towns, native and Russian. Near by is the *Takht-i-Suleiman*, or ‘Throne of Solomon’, a mountain of pilgrimage for Mahommedan pilgrims of Central Asia. Trade is with China. Altitude, 4000 feet; pop. about 50,000.

Oshkosh, a city of Wisconsin, United States, the county seat of Winnebago county, on Lake Winnebago; and served by the Chicago, Milwaukee, & St. Paul, the Chicago & North-Western, and other railways, and by river- and lake-steamers and electric-traction lines. There is an extensive lumber trade; carriages, wagons, and general wooden goods are manufactured. Oshkosh was settled in 1836, and became a city in 1853. Pop. (1920), 33,160.

Osian′der, Andreas, German theologian, follower of Luther, born in 1498, died 1552. He was present at the Diet of Augsburg in 1530, and his refusal to consent to the Augsburg Interim in 1548 cost him his situation as preacher at Nürnberg, but soon after he was appointed professor of theology in the newly erected University of Königsberg. He became involved in a theological controversy with Melanchthon in 1549, in consequence of his two treatises on the subject of righteousness by which sinners are justified (*De Lege et Evangelia* and *De Justificatione*).

Osi′ris, Egyptian *As-ar*, supposed by some to have been pronounced ‘Usir(i)’. The view has been urged that this god was of Libyan origin, and that his name originally signified ‘the Old One’. In pre-Dynastic times he was connected with the Delta city of Dedu, which the Greeks called Busiris; and after the Osirian faith spread southward, he was connected also with Abydos, where he was known as ‘first of the Westerners’. As the invention of the potter's wheel was credited to Ptah, god of Memphis, during the Pyramid Age, the introduction of the agricultural mode of life was credited to Osiris; he was also regarded as the introducer of good laws, and as one who visited peoples outside Egypt as a missionary. In the earliest Egyptian texts Osiris is regarded as a dangerous god, and he and his Underground Paradise in the west are greatly dreaded. The souls of the dead are adjured to go east, but at least one Pyramid text favours the west. Ultimately the Osirian cult of the west and the solar cult of the east were fused, while the local pantheons became solarized and Osirianized. At an early period Osiris was connected with the Nile. In one of his phases he controls that river; in another he is the Nile itself. The drama of the Nile must therefore be considered so that the ‘nature of Osiris’, declared to be ‘more secret than that of all gods’, may be investigated. In the days before this river was harnessed it fell so low that in parts it scarcely seemed to flow. The period of the ‘Low Nile’ was hazy, hot, and sterile. For fifty days the *Hamseen*, or ‘sand-wind’, swept from the south, coating every green thing with dust, and reducing the vitality of human beings and animals. In June the cool and refreshing north wind (the Etesian wind of the Greeks) began to blow, clearing away the dust from vegetation. Then the Nile commenced to rise. For a few days the river ran green, coloured by the green scum of stagnant pools which was pushed down by the fresh water from the distant tropical lakes suddenly swollen by heavy rain. This was the ‘Green Nile’, or ‘water of greenness’. Afterwards the rising Nile was tinged with red clay until it looked like blood. This was the ‘Red Nile’. Then it acquired a yellowish tint from the mud before it ultimately assumed a sky-blue colour. As soon as the sand was moistened by the ‘Green Nile’ it became alive with insect and other life, while grass and flowers appeared. That Osiris was regarded as the personification of the ‘Green Nile’ and as the vitalizing principle is made evident in the Pyramid Text (589), which reads, “Horus comes! He beholds his father in thee, *renpt* (greenness) in thy name of *Mu renpu* (water of greenness)”. Rameses IV recognized this aspect of Osiris in his hymn which declares: “Thou (Osiris) art indeed the Nile, great on the fields at the beginning of the season; gods and men live by the moisture that is in thee”. The ‘Green Osiris’, as the ‘Green Nile’, was supposed to make vegetation green. When the Egyptians puzzled themselves to discover what particular life-giving substance coloured the Green Nile, they concluded that it was malachite. As they believed that the river had its source in the sky, they then imagined ‘malachite pools’ and ‘malachite lakes’ situated beyond the horizon. In the pools the gods dwelt as birds and these birds were the ‘Imperishable

Stars' (Pyramid Texts, 1748, &c.). Pyramid Text 567 refers to the stars as a source of malachite powder (dew). Malachite was ground and mixed with fat to be used as an antiseptic for wounds, and for eye-paint for human beings and for gods. This paint was used "to make them healthy" (to ensure longevity). When it was found that copper could be extracted from malachite, Horus was depicted as a red god, and associated with the *mesniu* (copper-smiths). At Edfu Horus forged in his 'foundry' (temple) the copper sun which was drawn from the green (malachite) sun of the Underworld, where the 'Green Osiris' judged the dead. Men prayed for 'copper souls', and copper statues were made for kings. The Black Osiris was identified with the black mud of the 'low Nile', and when gold could be separated from the silver of natural electrum, with the black powder to which quicksilver was reduced in the process. Maspero notes that green powder and black powder formed part of the offerings to the dead in the Pyramid Age. The striking coincidence that a red metal came from green malachite, as a 'Red Nile' came after a 'Green Nile', appears to have left its impress on Egyptian religious ideas and myths. The new doctrines connected with metal symbolism were superimposed on the old doctrines connected with the god who was slain by his brother, and whose blood tinged the Nile. Other doctrines and myths were fused. The conflict between Horus and Set had originally a solar significance. It was introduced into the Osirian myth, Horus being identified with the son of Osiris, and Set with the slayer of Osiris. More myths and doctrines were added or created, Hathor, mother of Horus, figuring as Isis. Osiris was connected with the sun, moon, and stars, and the calendar, with the goat-god, the bull-god, &c., while he still retained his connection with the ancient pig-god, Set becoming the black pig. In the Greek period Osiris, as *Asar-hapi*, was the 'Serapis' bull-god. He never, however, lost his original character as the first man who opened or discovered the path to Paradise, where he became king and judge of the dead. In the Osirian Paradise the souls sowed and reaped barley and cultivated fruit-trees. Moral worthiness qualified souls to enter this paradise.

Oslo. See *Christiania.*

Osman Pasha, Turkish general, born at Tokat, in Asiatic Turkey, 1832, died in 1900. He entered the Turkish army in 1853; fought with distinction in the Crimean War, the Syrian rebellion, and the Crete campaign; but his great achievement was the defence of Plevna during the Russo-Turkish War (1877). He afterwards held the office of War Minister and other high posts.

Os'mium (symbol, Os; atomic weight, 190·9), one of the platinum metals; it is bluish-white and lustrous. It has a specific gravity of 22·5, being thus the heaviest of all bodies. It may also be obtained in crystals, or as a black amorphous powder, which is readily oxidized. Osmium is the most infusible of all the metals. It combines with chlorine in different proportions, also with sulphur, and forms alloys with some other metals. The oxide OsO_4 forms colourless crystals, is very volatile, and highly poisonous; it is an acidic oxide, and is also an oxidizing agent.

Osmo'sis and Osmotic Pressure. See *Solution.*

Osmun'da, the type-genus of Osmundaceæ (q.v.). *Osmunda regālis*, the flowering or royal fern, which grows to the height sometimes of 10 feet, is a native of Britain and other parts of the Old World, as well as of North America. It is often cultivated as an ornamental plant on account of its striking appearance, the fructification forming a fine panicle somewhat resembling that of a flowering plant.

Osmundaceæ, a small family of ferns, in many respects intermediate between the Eusporangiate and the Leptosporangiate divisions. The living genera are Osmunda and Todea. They are an ancient family, many species being known from the Mesozoic rocks.

Osnabrück, or **Osnaburg**, an ancient town of Prussia, in Hanover, on the Hase. It possesses many interesting buildings, and was formerly an important seat of linen manufacture, giving name to the coarse linen known as Osnaburg. The Treaty of Westphalia (1648) was discussed in the town hall of Osnabrück. Its chief manufactures are chemicals, iron and steel, paper, cotton, and tobacco.

Erected into a see in 888, the town was surrounded by walls in 1082. It entered the Hanseatic League, but never rose to be a free imperial city. Pop. (1919), 85,000.

Osorrei, or **Osorhei**, a town of Roumania, formerly in Hungary, and known as Maros Vasarhely. It is situated 80 miles by rail from Cluj (Kolozsvar). Pop. 25,000.

Osprey (*Pandion haliaëtus*), a well-known raptorial bird, called also *fishing-hawk*, *fishing-eagle*, and *sea-eagle*. It occurs both in the Old and New World, near the shores of the sea, or great rivers and lakes, and builds its nest in high trees and cliffs. It lives on fish, and pounces with great rapidity on its prey, as it happens to come near the surface of the water, the toes being armed with strong curved nails. The general body-colour is a rich brown, the tail being banded with light and dark (in the old birds the tail is pure white), head and neck whitish on their upper portions, and a brown stripe extends from the bill down each side of the neck; under parts of the body whitish, legs of a bluish tint. In length the osprey averages about 2 feet, the wings measuring over 4 feet from tip to tip. The female lays three or four eggs. The American bald-eagle (*Haliaëtus leucocephălus*) pursues the osprey, who drops his prey with the view of escaping, when the eagle immediately pounces after the descending fish, and seizes it ere it touches the water.

Osprey (*Pandĭon haliaëtus*)

Ossetes (os-sēts′), one of the numerous tribes or peoples inhabiting the Caucasus, belonging to the Indo-European family, and to the Iranic branch of it. They are at a lower stage of civilization than some of the neighbouring peoples. Their religion consists of a strange mixture of Christianity, Mahommedanism, and Paganism. They number about 170,000.

Ossett, a municipal borough of England, West Riding of Yorkshire, near the Calder; served by the Lancashire & Yorkshire and Great Northern Railways. It has woollen manufactures, and there are coal-mines in the neighbourhood. Pop. (1921), 14,802.

Ossian, a real or mythical Irish poet, to whom are attributed certain poems, the subject of a great literary controversy of the latter half of the eighteenth century and the commencement of the nineteenth. It originated by the publication of two epics, *Fingal* (1762) and *Temora* (1763), by James Macpherson (q.v.). Both are a record of the deeds of a great Celtic hero, Fingal. In the first of these poems he is assumed to war with the Danes, leading to their ultimate expulsion; but in *Temora* he is placed farther back, and his struggles are with the Romans. These and some minor poems Macpherson attributed to Ossian, the son of Fingal, and alleged that his version was a literal translation of works which had been transmitted orally in the Gaelic language from bard to bard until the introduction of writing permitted them to be committed to manuscript. Immediately on the publication of *Fingal* it attained an immense popularity. It was translated within a year into all the principal languages of Europe, and numbered among its admirers the ripest scholars and the most distinguished men of genius of the age. The question of authenticity which was raised immediately on the publication of *Fingal* was noticed with somewhat lofty disdain by Macpherson in his preface to *Temora*, and although he then professed to be able to meet it by the production of the originals, he generally maintained throughout the controversy an angry silence. At first the judgment of Dr. Blair, who wrote an elaborate critical dissertation in favour of the authenticity of the poems, was regarded as of paramount authority throughout Europe; and notwithstanding the emphatic denunciation of Dr. Johnson, and objections of other critics, the believers in the genuineness of Ossian continued to hold their ground until Malcolm Laing's unsparing criticism, first in the introduction to his *History of Scotland* (1800), and afterwards in an annotated edition of the poems themselves (1805), gave a death-blow to the position of those who maintained the integrity of the Ossianic epics. In 1797 the Highland Society chose a committee to inquire into the authenticity of the poems. The report published in 1805 states that the committee had not been able to obtain any one poem the same in title and tenor with the poems published by Macpherson; that it was inclined to believe that he was in the habit of supplying chasms, and of giving connection by inserting passages which he did not find, and to add what he conceived to be dignity and delicacy to the original, by striking out passages, by softening incidents, by refining the language, &c., but that it was impossible to determine to what degree he exercised these liberties. In 1807, after the death of Macpherson and in accordance with his will, appeared the Gaelic originals of his poems, with a Latin translation, and accompanied by a new dissertation on their authenticity by Sir John Sinclair. Hence arose a new and singular controversy. It was asserted that these originals, the manuscripts of which were all in the handwriting of Macpherson, were translated by himself from the English, and this charge seems to be about as well substantiated as that of the original fabrication. What appears really to have been decided, is that Ossian was a real or mythical Irish bard of the second or third century, of whom there are probably no authentic remains, although some brief poems, which cannot be traced farther back than the eleventh century, are attributed to him. There are numerous traditions regarding him both in Scotland and Ireland. That Macpherson possessed considerable, and often conflicting material, collected in the Highlands, which he worked up into a continuous whole, in epic form, and that he himself produced the connecting links, seems beyond doubt.—BIBLIOGRAPHY: G. Eyre-Todd, *Introduction to Macpherson's Poems of Ossian*; A. T. Nutt, *Ossian and the Ossianic Literature*; J. F. Campbell, *Popular Tales of the West Highlands, Orally Collected with a Translation.*

Ossoli, Margaret Sarah Fuller, American author, was born in 1810 and died 1850. She edited *The Dial* and contributed to *The New York Tribune*. She married the Marchese Ossoli, and both perished in a shipwreck off Long Island.

Ossovetz, or **Osowiec**, a fortress town of Poland, on the Bobr. It was of enormous strategic importance during the European War. The Bobr is a small stream of no great breadth but over 12 feet deep. It traverses a valley of impassable swamps, across which the high road and railway lines run by the only practicable crossing. This crossing was defended by Ossovetz, then a Russian third-class fortress, with solid-concrete forts, and modern heavy guns made in the Putilov foundries. On 25th Sept., 1914, the German assault began, and the Russians opened the sluices of the Bobr. The town was bombarded for four days (27th Sept. to a.m. 1st Oct.) with little effect, and the swamp and the narrow causeway beat the Germans, whose infantry lines were deployed at a distance of four miles. A sortie by the garrison accounted for three German guns, and forced the besieging force to withdraw. As the offensive on the Niemen had also failed, the Russians resumed their onward march a fortnight later. In February and April, 1915, renewed attempts were made to take the town but were of little avail. On 19th Aug., 1915, the entire front from Ossovetz to Vladimir Volynsky was evacuated, and on 22nd Aug. the forts of Ossovetz were definitely abandoned and the Russians withdrew to the Brest-Litovsk line. It is a peculiar point about Ossovetz that before the continuous bombardment of the heaviest siege artillery of Europe it could not be reduced, whereas infinitely more powerful and better-equipped fortresses on all fronts had readily succumbed. See maps under *European War.*

Ostade (os-tä′de), Adrian van, a painter of the Flemish school, and a pupil of Francis Hals, born at Lübeck in 1610, died at Amsterdam 1685. His pictures, amounting to several hundreds, are clear and rich in colouring, and highly finished.

Ostade, Isaac van, brother of the preceding, born 1621, died 1649, first imitated him, but was more successful in a style of his own (animated landscapes). He was often solicited by landscape-painters to add his figures to their pieces.

Osteitis, inflammation of the substance of bone. In its chronic forms it may result in suppuration; in caries, a decay of the bone in particles; or in necrosis, a decay of the bone in slices. In acute cases low diet, aperients, &c., are employed; but in chronic cases tonics, good air, and possibly removal of the diseased bone may be required.

Ostend′, a seaport and principal sea-bathing resort of Belgium, province of West Flanders, on the North Sea, 67 miles north-west of Brussels. It is situated on a sandy plain, and is protected against the sea by a solid wall of granite. The entrance to the port is narrow, and dangerous in bad weather, but the basins within are very extensive. The cod- and herring-fishing and the cultivation of oysters are considerable industries, and the export of butter, eggs, poultry, and rabbits is extensive. It is a station for Dover and London steamers, and a terminus for branch railway lines connecting the town with various Continental systems. There is a Kursaal. Ostend dates from 1072, and sustained a memorable siege by the Spaniards from 4th July, 1601, to 28th Sept., 1604, when it capitulated. During the European War (q.v.) it was taken by the Germans on 14th Oct., 1914. Pop. 45,900.

Under German occupation the digue at Ostend became a fortress, a veritable city of blockhouses, concrete-works, gun-platforms, and dugouts, and the Tirpitz battery of heavy guns, with a range of 30,000 yards, was placed in position alongside, the guns being protected by cupolas of special thick armour. In the early months of the occupation the German High Command realized the value of Ostend as a base for harassing operations with torpedo-craft, and indeed for aggressive naval effort of whatever description. The narrow and tortuous channel to the town was carefully dredged, and the canal from Bruges to Ostend thoroughly surveyed. Towards the end of 1916 German ' raids ' from Ostend and Zeebrugge became so frequent that it was urged upon the authorities that the only method of stopping these raids was to destroy the Flanders ports. Tons of high explosives had already been dropped by air-craft, but the damage, however great, had always been more or less repaired. In Nov., 1917, the Plans Division of the Admiralty, at the head of which was a young flag-officer named Roger Keyes, conceived and elaborated a programme for the permanent disablement of Zeebrugge and Ostend by sealing them up with concrete-filled block-ships. On the morning of 23rd April, 1918 (St. George's Day), the Zeebrugge-Ostend block-ships moved off, the Ostend operations being under the direction of Commodore Hubert Lynes, R.N. A change of wind rendered the scheme practically abortive, and the flares, carried by motor-launches to show the ends of the wooden piers leading to the harbour, were extinguished by gun-fire, with the result that the block-ships ran aground and were blown up outside the entrance. The *Vindictive*, still seaworthy, but badly battered, was chosen for a second attempt, and set out again on 9th May. Commodore Lynes was again in chief command, Commander A. E. Godsal taking command of the *Vindictive*. The Germans were completely surprised, and two motor-boats had torpedoed the pier ends, and seaplanes and monitors were already bombarding the shore batteries, before a return fire was opened. Under a hail of projectiles the *Vindictive* steamed in with controls demolished, Commander Godsal in the conning tower. As she laid her nose to the eastern pier, and prepared to swing her 320 feet of length across the channel, the conning-tower was struck by a shell from the shore batteries and Commander Godsal was blown to pieces. Lieutenant V. A. C. Crutchley, V.C., took command, but the *Vindictive* was lying at an angle of about 40° to the pier, hard and fast. The commander gave the order to clear the engine-room and abandon ship. Engineer-Lieutenant-Commander Bury was last man off, and he blew the main charges by the switch installed aft. Lieutenant Crutchley blew the auxiliary charges in the forward 6-inch magazine, and the old ship sank and lay on the bottom of the channel. For all practical purposes Ostend was immobilized, and Bruges was deprived of importance as a torpedo base. The losses were slight, and were chiefly incurred by the *Vindictive* company when abandoning ship. See *European War*.

Osteopathy, a system of medical treatment founded in 1874 by an American physician, Dr. A. T. Still. The leading idea of the system is that structural derangement of the body is the chief cause of disease. All the tissues of the body are subject to such derangements, or 'lesions'. For the treatment of these, osteopathists hold that drugs are useless. Their method is to adjust the affected parts by finger manipulation, and to leave the rest to nature.

Osterode (os'te-rō-dė), (1) a town of Prussia, in Hanover, at the foot of the Harz Mountains. It manufactures woollen, cotton, and linen goods. white lead, leather, oil, machinery, &c. Among its buildings are St. Giles's Church (724) and the Rathaus (1552). Pop. 7500. (2) A town of East Prussia, on a small lake (Drewenz), with manufactures of machinery, distilleries, &c. Pop. 13,063.

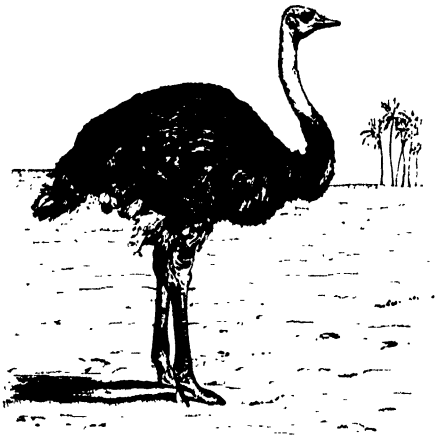
Os'tia, an ancient city of Italy, at the mouth of the Tiber. It was of great importance as the port of Rome and as a naval station, and for a long period it engrossed the whole trade of Rome by sea. The port, however, was never good, and owing to the gradual accumulation of the mud and other deposits brought down by the river it ultimately became inaccessible to ships of large tonnage. Many efforts were made by various Roman emperors to improve the port, but without much success. It was destroyed by the Saracens in the ninth century. Excavations were begun under Pope Pius VII, again in 1854, and in 1880, disclosing three temples, a theatre, the forum, &c. The modern Ostia (founded by Gregory IV in 830) is a village connected by tramway with Rome and the sea-beach.

Ostra'cion, the type genus of the trunk-fishes (Ostraciontidæ), included in the division Plectognathi, which forms a sub-order of the Teleostei or bony fishes. The body is enclosed in a literal armour-casing of strong bony plates or scales of the ganoid variety, which are immovably united, and invest every part of the body save the fins, of which the dorsal and anal are the chief agents of locomotion, while the pectorals draw currents of water over the gills. The caudal fin is used as a rudder, or for propulsion. These fishes do not attain a large size, and are common in tropical seas.

Os'tracism (Gr. *ostrakon*, a shell), a political measure practised among the ancient Athenians by which persons considered dangerous to the State were banished by public vote for a term of years (generally ten), with leave to return to the enjoyment of their estates at the end of the period. It takes this name from the shell or tablet on which each person recorded his vote. The votes were counted by the archons, and in the event of there being 6000 votes against a statesman he was obliged to leave the city within ten days. Among the distinguished persons ostracized were Themistocles, Aristides, and Cimon, son of Miltiades, who were afterwards recalled. Ostracism was introduced at Athens 508–507 B.C., and was abolished in about 417 B.C.

Os'trau: *Moravian Ostrau*, a town of Czecho-Slovakia, in Moravia, on the Ostrawitza. It has coal-mines, ironworks, and candle-factories. Pop. 37,000.—*Polish Ostrau*, which adjoins this town, formerly in Austrian Silesia, is engaged in the same industries. Pop. 23,000.

Ostrich (*Struthio camēlus*), a running bird, of the family Struthionidæ, of which it is the type. It inhabits the sandy plains of Africa, Arabia, and Mesopotamia, and is the largest bird existing, attaining a height of from 6 to 8 feet. The head and neck are nearly naked; the general body plumage is black, the wing and tail feathers white, occasionally with black markings; the quill-feathers of the wings and tail have their barbs wholly disconnected, hence their graceful appearance. The legs are extremely strong, the thighs naked. There are only two toes, the hallux or hind toe being wanting. The pubic bones are united, a conformation occurring in no other bird. The wings are of small size and are incapable of being used as organs of flight, but the birds can run with extraordinary speed, outdistancing the fleetest horse. The bill is broad and of a triangular depressed shape. The food consists of grass, grain, &c., and substances of a vegetable nature, and to aid in the trituration of this food the ostrich swallows large stones, bits of iron and glass, or other hard materials that come in the way. Ostriches are polygamous, each male consorting with several females, and they generally keep together in flocks. The eggs average 3 lb. in weight, and several hens often lay from ten to twelve each in the same nest, which is merely a hole scraped in the sand. The eggs appear to be incubated mainly by the cock-bird, assisted by his hens in the daytime, but also partly by the heat of the sun. The South African ostrich is often considered as a distinct species under the name of *S. austrālis*. Three South American birds of an allied family (Rheidæ), of the genus *Rhea*, are popularly known as the American ostriches, differing chiefly from the African form in having the head feathered and three-toed feet, each toe armed with a claw. (See *Rhea*.) The ostrich has been hunted from the earliest ages for its feathers, which have always been valued as a dress decoration. The feathers of the back are those most valued, the wing and tail feathers rank next. The black plumes are obtained by dyeing. The finest white feathers are exported from Tripoli, Egypt, Tunis, and Algiers, and the bulk of these find their way to Paris. Great Britain imports most of its ostrich feathers from Cape Colony. Ostriches having become scarce in that country, an attempt was made about 1858 to domesticate them, and with such success that ostrich-farming forms an important source of wealth. The market value of the feathers naturally varies with their quality, the prevailing fashion, and the supply.



Ostrich (*Struthio camēlus*)

Ostrog, an old town of Russia, government of Volhynia. It is the place where the Bible was first printed in Slavonic (1581). Pop. 20,000.

Ostwald, Wilhelm, German chemist, born at Riga in 1853, and educated at Dorpat. He was professor of chemistry at the polytechnic in Riga from 1882 to 1887, when he was appointed professor of physical chemistry at Leipzig. This post he held until 1906. He made important discoveries in physical chemistry, including the Dilution Law which bears his name and which shows the relationship between molecular conductivity and dilution. His work on catalysis, especially in the manufacture of nitric acid by the catalytic oxidization of ammonia, was the foundation of industries important both from the standpoint of economic production and in making the explosive manufacturers of his country independent of the imported supplies of nitrates. During the European War, when importation was impossible, the synthetic production of nitrates was a factor of considerable importance to Germany. Ostwald was honoured by many British and foreign universities and learned societies. He was the founder of a number of German scientific periodicals, and is the author of many works on chemistry, most of which have been translated into English.

Ostyaks, or **Ostiaks**, three different tribes of Finnish origin inhabiting the north-west of Siberia. They are known as the Ugrian Ostyaks, the Samoyedic Ostyaks, and the Yenisei Ostyaks. They inhabit the banks of the Irtysh and the Ob and the Yenisei, between the Upper and Lower Tunguska. The first two tribes are both linguistically and racially akin, whilst the Yenisei Ostyaks differ linguistically and to some extent physically from all the tribes living in Siberia. All the three tribes number now about 25,000. Their religion is mostly Shamanism, although the Yeniseian Ostyaks are officially reckoned as members of the Russian Orthodox Church.—Cf. article in Hastings's *Encyclopædia of Ethics and Religion*.

Osu'na (ancient **Urso**, later **Orsona**), a town of Southern Spain, in the province of Seville. It has a church built in 1584 on the site of a Moorish mosque. Manufactures include iron, linen, soap, articles in esparto, &c., and there is a large trade in oil, grain, &c., with Seville and Malaga. Osuna was taken from the Moors in 1240. Pop. 15,650.

Oswald, King of Northumbria, 634–42. He ruled over an extensive territory, including Angles, Britons, Picts, and Scots. He laboured to establish Christianity on a firm footing, being in this assisted by St. Aidan. He was killed by Penda of Mercia at the battle of Oswestry.

Oswaldtwistle, an urban district of Lancashire, England, served by the Lancashire & Yorkshire Railway. There are cotton-factories, print-works, coal-mines, and stone-quarries in the district. Pop. 16,000.

Oswe′go, a city and port of entry of New York, United States, the county seat of Oswego county, on the Oswego River, where it falls into Lake Ontario. It is served by the New York, Central, & Hudson River; the New York, Ontario, & Western; and the Delaware, Lackawanna, & Western Railways; by steamboat, and by the Oswego Canal (Lake Ontario-Erie Canal). It is famous for its vast starch-factory, and has extensive mills, tanneries, foundries, machine-shops, and shipyards. The river supplies ample water-power. Founded in 1724, it became a city in 1848. Pop. (1920), 23,626.

Oswestry (os′es-tri), a rural district and municipal borough of England; served by the Great Western and the Cambrian Railways. It is of great antiquity, deriving its name from Oswald, King of Northumbria, slain here in 642, and makes some figure in early English history. Coal and limestone are worked in the neighbourhood. There are railway workshops, agricultural implement works, and breweries. In the neighbourhood are Oswald's Well and Old Oswestry. Pop. (1921), 9790. The rural district has a pop. of 16,813.

Osyman′dyas, an ancient king of Egypt, mentioned by Diodorus Siculus, who reports that he invaded Asia with a vast army, and penetrated as far as Bactria, and that on his return he erected at Thebes a monument to himself of unparalleled magnificence, with a sitting colossal statue of enormous size. The Memnonium at Thebes has been represented as his monument.

Ota′go, a provincial district of New Zealand, in the South Island, till 1876 one of the original six provinces. It is situated south of the provincial districts of Canterbury and Westland; area, 13,960 sq. miles. The interior is mountainous; many peaks attain the height of from 3000 to 9000 feet, but there is much pastoral land; the north-east consists of extensive plains. Otago, although it possesses valuable gold-fields, is chiefly a pastoral and agricultural district, second only to Canterbury in wheat production. The climate is similar to that of Britain, but warmer and more equable. The largest river is the Clutha or Clyde, the largest of New Zealand. There are also extensive lakes, as the Te Anau, 132 sq. miles; the Wakatipu, 112 sq. miles in area. Coal has been found in abundance. Otago was founded in 1848 by the Scottish Free Church Association; it is now the most populous division of the Dominion. The capital is Dunedin; the next town in importance is Oamaru. Pop. 132,000.

Otal′gia, a painful affection of the ear. It may be due to inflammation of the ear; it may be a symptom of other diseases; or, it may be a species of neuralgia. It is often associated with other nervous ailments such as toothache, and neuralgic pains in the face; and as its intensity and duration generally depend upon the condition of the latter, otalgia is probably only a local symptom of the other troubles. Children, especially during their fast-growing period, are frequently subjected to otalgic pains. The treatment adopted in neuralgic affections is usually and with success also applied to this complaint.

Otaru, a seaport of Hokkaido, Japan, on the main railway lines to Sapporo. Pop. 90,000.

Otho, Marcus Salvius, Roman emperor, born A.D. 32, died by his own hand A.D. 69. He joined Galba when he rebelled against Nero, and on his accession in 67 Otho became his favourite and was made consul; but when Galba appointed Piso as his successor Otho bribed the army, had Galba and Piso murdered, and was proclaimed emperor in 69. He was acknowledged by the eastern provinces, but in Germany Vitellius was proclaimed by his legions. The latter, having led his army into Italy, overthrew the forces of Otho at Bebriacum, who killed himself after reigning for three months and a few days.

Otididæ, a family of carinate birds comprising the bustards, and usually included in the ord. Gruiformes.

Oti′tis, inflammation of the ear, accompanied with intense pain. Within the tympanum it is called middle-ear disease; and like all other inflammations it may be acute or chronic. It often follows the simple exanthemata of childhood. Tubercular and syphilitic subjects are particularly liable to this disease. Otitis is often a serious malady, producing fever and delirium, and ending in suppuration, and generally in the rupture of the tympanum and more or less deafness. It may, and usually does, spread backward into the mastoid process, causing a mastoid abscess. The peculiar seriousness of middle-ear disease is due to the risk of the spread of the inflammatory process to the brain or its large venous sinuses, causing abscess of the brain or clotting of the blood in the sinuses, either of which may lead to fatal results.

Otley, an urban district and town of Yorkshire (West Riding), England, on the Wharfe; served by the Midland and North-Eastern Railways. It has a grammar-school, founded 1602; a Norman church (All Saints), containing relics of the Fairfax family; and a mechanics institute (1869). Machine-making is the principal industry. Pop. (1921), 9536.

O'toliths, small calcareous bodies contained in the membranous labyrinths or internal ears of vertebrates; and also in the sense-organs concerned with maintenance of balance (statocysts) that occur in molluscs, crustacea, some annelids, and certain jelly-fishes. In some crustacea, as prawns, the statocysts open externally, and foreign particles (sand-grains, &c.) introduced from the exterior play the part of otoliths.

Otorrhœa, a purulent or muco-purulent discharge from the ears following middle-ear disease.

Otran'to (ancient **Hydruntum**), a city of Apulia, Southern Italy, in the province of Lecce, and on the south-east coast of the Strait of Otranto. It is joined by railway to Brindisi (45 miles), and is the starting-point of submarine cables to Valona and Corfu. Otranto was taken from the Byzantine emperors in 1068 by Robert Guiscard, and was razed by the Turks in 1480. Prior to that time it was of great commercial importance, but the modern city is dormant commercially.

Otta'va Rima (i.e. *octuple rhyme*), a form of versification consisting of stanzas of two alternate triplets, and concluding with a couplet. It is thus composed of eight five-foot lines, rhyming ab, ab, ab, cd. It seems to have been a favourite form with Italian poets even before the time of Boccaccio. The regular ottava rima is composed of eight eleven-syllable lines with dissyllabic rhyme. Lord Byron has employed it in his *Don Juan* and *Beppo*, commonly using, however, ten-syllable instead of eleven-syllable lines. It has also been employed by Spenser in his *Muiopotmos*. The ottava rima with the fifth line dropped out, or the seven-line stanza (ab, ab, b, cd), was employed by Chaucer and revived by William Morris.

Ot'tawa, the ninth river of Canada and the principal tributary of the St. Lawrence, rising in the Laurentian Plateau (Quebec Province), and forming for some distance the boundary between Ontario and Quebec. It discharges into the St. Lawrence above Montreal, after a course of about 760 miles. The Chaudière Falls above the city of Ottawa are 200 feet wide and 40 feet high, and provide hydro-electric power. The city of Ottawa consumed 54,000 h.p. of electric energy so generated in 1921. Lumber is sent down-stream by the main river and by the tributaries Rideau, Madawaska, Lièvre, Coulogne, and Gatineau.

Ottawa, a city of Ontario, Canada, in Carleton county, the capital and administrative centre of the Dominion. It stands on the Ottawa, where it receives the Rideau, and is served by all Canadian transcontinental lines, by the New York Central Railway, and by electric tramways. River-steamers connect with Montreal and Kingston on the St. Lawrence (via the Rideau Canal) during the summer season. On 3rd Feb., 1916, the Dominion Parliament buildings, excepting the Senate House and library, were destroyed, and have been reconstructed, the main front being 470 feet long and 100 feet high, surmounted by a tower of 300 feet. Other notable buildings are the National Museum, the Observatory, the Dominion Mint, Rideau Hall (the Governor-General's official residence), and the Château Laurier, an enormous hotel in Major's Hill Park (facing Parliament buildings), owned and controlled by the Grand Trunk Railway. There are Anglican and Roman Catholic cathedrals, and a Catholic university. Ottawa is a centre of the Canadian lumber trade, and immense quantities of timber pass through the city's innumerable sawmills. Other industries are mainly dependent upon the hydro-electric power generated by the Chaudière and Rideau Falls, and include iron-works and foundries and factories for the production of cement, candles, paper and paper-pulp, agricultural implements, and tents. In 1920 there were 388 industrial establishments of all classes. Pop. 107,732.

Ottawa was founded in 1827 by Colonel By of the Royal Engineers, who built a canal from the Chaudière Falls to Kingston on Lake Ontario, but the site and falls were described by Champlain in his *Voyages* of 1613. The canal was the precursor of Bytown, which in 1854 became a city as Ottawa, and in 1858 Ottawa became the Canadian capital.

Ottawa, a city of Illinois, United States, the county seat of La Salle county, on the Illinois; served by the Chicago, Rock Island, & Pacific, and the Chicago, Burlington, & Quincy Railways, and by the Illinois and Michigan Canal. It is the seat of a college, and has manufactures of agricultural implements, carriages and wagons, musical instruments, and tobacco. In the vicinity is a medicinal spring; coal, glass-sand, and clay are found near by. Ottawa was founded in 1830, and became a city in 1853. Pop. 11,120.

Otter, a carnivorous mammal, family Mustelidæ or weasels, genus Lutra. There are several species, differing chiefly in size and fur. They all have large flattish heads, short ears, webbed toes, crooked nails, and tails slightly flattened horizontally. The common river-otter, the *Lutra vulgāris* of Europe and Asia, inhabits the banks of rivers, feeds principally on fish, and is often very destructive, particularly to salmon. The under fur is short and woolly, the outer is composed of longer and coarser hairs of dark-brown hue. They burrow near the water's edge, line their nest with grass and leaves, and produce from four to five young. The weight of a full-grown male is from 20 to 24 lb.; length from nose to tail 2 feet, tail 15 to 16 inches. Otter-hunting in Great Britain is now limited to a few districts. The American or Canadian otter (*Lutra canadensis*) averages about 4 feet in length inclusive of the tail. It is plentiful in Canada, and furnishes a valuable fur, which is a deep reddish-brown in winter, and blackish in summer. Other species are found in South America, Africa (South and West), India, and Malaya. The sea otters (Enhydris), represented typically by the great sea-otter (*E. lutris*), inhabit the coasts of the North Pacific Ocean, but are of comparatively rare occurrence. The tail is short, measuring about 7 inches only; weight 60 to 70 lb. The fur is soft, and of a deep lustrous black, or of a dark maroon colour when dressed, and is much prized. In general appearance the sea-otter somewhat resembles a small seal.

Otters (*Lutra vulgăris*)

Otto I, the *Great*, Emperor of Germany, son of Henry I, born 912, died 973. He was crowned King of Germany at Aix-la-Chapelle in 936. His reign of thirty-six years was an almost uninterrupted succession of wars. After a fourteen years' struggle he subdued Boleslas, Duke of Bohemia; he wrested the Duchies of Suabia, Bavaria, and Lorraine from the Dukes of Bavaria and Franconia, and gave them (in 949) to his sons Ludolf and Henry, and to his son-in-law Conrad, Count of Worms, respectively. He delivered the Italians from the oppressions of Berengar II, married the widow of their last king, and was crowned King of Lombardy (951). In 961 he was crowned King of Italy, and in the following year emperor by Pope John XII, who took the oath of allegiance, but soon repented and took to arms. Otto deposed him and placed Leo VIII in the Papal chair; he also punished the Romans for replacing John after his departure. The Byzantine court refused to acknowledge Otto's claim to the imperial dignity; but he defeated the Greek forces in Lower Italy, and the Eastern emperor, John Zimisces, gave the Greek Princess Theophania to his son Otto in marriage.

Otto II, youngest son of Otto I, was born in 955, died at Rome 983. His elder brothers had all died before their father, who caused him to be crowned King of Rome — the first instance of the kind in German history. He subdued the revolt of several powerful vassals, including his cousin, Henry II, Duke of Bavaria. In Italy he suppressed a rising under Crescentius, and then attempted to drive the Greeks from Lower Italy; but they called in the aid of the Saracens from Sicily (981), and Otto suffered a total defeat (982). He escaped by leaping into the sea, was picked up by a Greek ship, from which he afterwards escaped by a ruse, and died soon after at Rome.

Otto III, son of the preceding, and the last of the male branch of the Saxon Imperial House, born 980, died 1002. He was only three years old when he succeeded his father. At the age of fifteen he marched into Italy and crushed a fresh insurrection fomented by Crescentius. He was consecrated emperor in 996 by Gregory V, a near relative of his own. He next suppressed a second rebellion under Crescentius, whom he caused to be beheaded. John XVI, the Pope installed by the latter, was also captured, cruelly mutilated, and killed by the populace. On the death of Gregory, Otto raised his old tutor, Gerbert, to the pontificate under the title Sylvester II. Peace in Rome was, however, only temporary, and until his death Otto was mostly employed in quelling disturbances in various parts of Italy. Some historians assert that his death was due to poisoning, an act of revenge on the part of the widow of Crescentius.

Otto I, King of Greece, second son of King Ludwig I of Bavaria, born 1st June, 1815, died 26th July, 1867. Educated at Munich, he travelled in Germany and Italy for the purpose of completing his education. Nominated King of Greece by the Conference of London on 7th May, 1832, he was recognized by the Greeks on 8th Aug., 1832, and ascended the throne on 6th Feb., 1833. Married to Princess Amelia of Oldenburg he had no children and founded no dynasty. When the Revolution of 1862 drove him from the throne he returned to Bamberg in Bavaria, where he died.

Ottoman. See *Turkey*.

Ot'tumwa, a city of Iowa, United States, the county seat of Wapello county, on the Des Moines; served by the Chicago, Milwaukee, & St. Paul, the Wabash, and the Chicago, Rock Island, & Pacific Railways. It is a centre of coal-mining, and has industries of pork-packing and iron and steel manufactures. It was founded in 1843, and became a city in 1857. Pop. (1920), 23,000.

Otway, Thomas, English dramatist, was born in 1652, and died in 1685. He was educated at Winchester and Christ Church, but left Oxford without a degree. He was always interested in the stage, and after a highly unsuccessful appearance as an actor in Mrs. Behn's *Forc'd Marriage*, he began to write plays. His earliest play, a feeble tragedy *Alcibiades*, was produced in 1675, and saved from complete failure by the acting of Betterton and Mrs. Barry, who acted in all Otway's plays. His next play, *Don Carlos* (1676), was a better play, and won great popularity in spite of the wholesale slaughter at the end of it. Otway adapted Racine's *Bérénice* and Molière's *Les Fourberies de Scapin*, the latter retaining the stage until last century. His original comedies *Friendship in Fashion* (1678), *The Soldier's Fortune* (1681), and *The Atheist* (1684) are undistinguished by any merit. Nor can much be said in favour of his tragedy *The History and Fall of Caius Marius*, a curious hybrid in which part of *Romeo and Juliet* is grafted on to Plutarch's *Life of Marius*. The two works which keep the fame of Otway alive are *The Orphan* (1680), a most pathetic play, and his masterpiece *Venice Preserved* (1682), which is easily the greatest of all Restoration tragedies, in spite of its witless comic scenes which satirize the first Earl of Shaftesbury under the name of Antonio. Otway lived in extreme poverty, and the usually accepted story of his death is that he choked when ravenously eating some bread after a long period of inanition. He was madly in love with Mrs. Barry, the principal actress in his plays, and though this unrequited affection made his life unhappy, it probably made him a better tragic poet. *The Orphan* and *Venice Preserved* tower high above the bombast and the banalities of the Restoration stage. —Cf. E. Gosse, *Seventeenth Century Studies*.

Oudenarde (ō-dn-ärd), or **Audenarde**, a town of Belgium, province of East Flanders, on the Scheldt. The Hôtel de Ville, dating from the sixteenth century, is one of the finest town halls in Belgium. The town has sustained several sieges, but is best known in history by the memorable victory gained over the French on the 11th of July, 1708, by Prince Eugene and the Duke of Marlborough. Pop. 6950.

Oudh, or **Oude** (oud), the eastern portion of the United Provinces of Agra and Oudh, bounded on the north by Nepál, and on the other sides by the province of Agra; area, 24,158 sq. miles. Oudh, formerly a Mogul province (subsequently kingdom, 1819), became subordinate to the British after the battle of Kalpee, in 1765. The king was deposed for misgovernment in 1856, and his territory was amalgamated with the North-Western Provinces. Since 1902 Oudh has been joined to these to form the United Provinces of Agra and Oudh. Lucknow is the capital. Pop. 12,560,000 (mostly Hindus).

Oudinot (ō-di-nō), Charles Nicolas, Duc de Reggio, peer and marshal of France, born at Bar-le-Duc in 1767, died in 1847. In 1791 he was elected commandant of a volunteer battalion, and gave many striking proofs of valour, which gained him speedy promotion. In 1792 he was colonel of the regiment of Picardy, in 1793 brigadier-general, and in 1799 general of division. Masséna made him chief of the general staff, and under his command he decided the battle of the Mincio. In 1804 Napoleon gave him the command of a grenadier corps of 10,000 men, at the head of which troops he performed many exploits, winning the battle of Ostrolenka, and deciding the fate of three great battles—Austerlitz, Friedland, and Wagram. After the last-named battle Napoleon made a him marshal and duc de Reggio, and gave him an estate worth £4000 a year. He was severely wounded in the Russian campaign of 1812, and in the campaign of 1813 he was defeated at Grossbeeren and Dennewitz. In the campaign of 1814 he took an active part and was wounded for the twenty-third time. After Napoleon's abdication he gave his adhesion to the Bourbons, to whom he ever afterwards remained faithful, and who heaped upon him every honour.—His eldest son, Nicolas Charles Victor, born in 1791, died in 1863, commanded the troops which effected the capture of Rome from Garibaldi in 1849.

Ounce (*Felis Uncia*)

Ounce (*Felis Uncia*), one of the digitigrade carnivora, found in Northern Africa, Arabia, Persia, India, and China. The length of the body is about 3½ feet, the tail measuring about 2 feet. It is a large cat, resembling the leopard and panther, but with a longer and more hairy tail and a thicker fur, somewhat less in size, and not so fierce and dangerous. In some places it is trained to hunt, like the cheetah.

Oundle School was founded by Sir William Laxton (died 1556), who was Lord Mayor of London in 1544, and a prominent member of the Grocers' Company. The school is still maintained by the Worshipful Company of Grocers. The new schools were built in 1883, and have been greatly enlarged since. There are nine boarding-houses as well as a preparatory house. A large block, including a great hall, library, art museum, and class-rooms, was opened in 1910. A new science block was built in 1914. The five laboratories are splendidly equipped. A school chapel is being built as a war memorial. There are 540 boys at the school, which owes much of its success to F. W. Sanderson, who was headmaster from 1892 until his death in 1922, and who introduced highly original and effective methods of education.

Ou'rebi, *Nanotragus scoparia*, an antelope of South Africa, found in great numbers in the open plains, and much hunted for its flesh. It is from 2 to 3 feet high, of a pale-dun colour, and the male has sharp, strong, and deeply ringed horns.

Ouro-Preto (ō'ro-prā'to), a city of Brazil, in Minas-Geraes, on the railway from Rio de Janeiro. Founded in 1711 as Villa Rica, it was the capital of the state till 1897, when it was superseded by Bello Horizonte, or Minas. It was once one of the great mining centres of Brazil, but the gold-mines are now exhausted. Pop. about 15,000.

Ouse (ōz), a river of Yorkshire, formed by the junction of the Swale with the Ure near Boroughbridge; it flows tortuously south-east past York, Selby, and Goole, 8 miles east of which it unites with the Trent to form the estuary of the Humber. Its total course is 60 miles, for the last 45 of which (or to York) it is navigable.

Ouse (ōz), **Great,** a river of England, rises near Brackley, in the county of Northampton, flows in a general north-easterly direction, traverses the counties of Buckingham, Bedford, Huntingdon, Cambridge, and Norfolk, and falls into the Wash at King's Lynn, after a course of about 160 miles, for the latter two-thirds of which it is navigable.

Ouseley, Rev. Sir Frederick Arthur Gore, Bart., English composer, born 1825, died in 1889, only son of Sir Gore Ouseley, at one time British Ambassador to Persia and Russia. His works include treatises on harmony, on counterpoint and fugue, and on musical form and general composition, and he wrote much church music.

Outcrop, in geology, the exposure of any rock at the surface of the ground. An inclined stratum will produce an outcrop running practically in the direction of the strike.

Out'lawry, the state of being deprived of all rights, i.e. put outside the law and its protection. It originated as a process resorted to against an absconding defendant in a civil or criminal proceeding. It involved the deprivation of all civil rights, and a forfeiture of goods and chattels to the Crown. Outlawry in civil proceeding was formally abolished in England in 1879. In Scotland outlawry is a sentence pronounced in the supreme criminal court, where one accused of a crime does not appear to answer the charge. The effect is that he is deprived of all personal privilege or benefit by law, and his movable property is forfeited to the Crown.—Cf. Pollock and Maitland, *History of English Law*.

Outram (ou'tram), Sir James, British soldier, born at Butterley Hall, Derbyshire, 1803, died 1863. In 1819 he joined the East India Company, and in 1828 he was selected to undertake a mission to the wild hill tribes of the Bombay Presidency, a task in which he acquitted himself with credit. As adjutant to Lord Keane he took part in the Afghan War in 1839, and distinguished himself at the capture of Khelat, and by his dangerous ride disguised as a native devotee through the enemy's country to Kurrachee (1840). After the capture of Ghuznee he performed the duties of British Resident at Hyderabad, Sattara, and Lucknow. Nominated Chief Commissioner of Oudh in 1856, he commanded the Persian expedition in 1856 – 7. During the Mutiny he joined Havelock at Cawnpore in Sept., 1857, and fought under him until Lucknow was relieved by Sir Colin Campbell. He was created a baronet, and received the thanks of Parliament. He died at Pau, and was buried in Westmister Abbey.

Out'rigger, an iron bracket fixed on the side of a boat, with a rowlock at its extremity, so as to give an increased leverage to the oar without widening the boat; hence, a light boat for river matches provided with such apparatus. The name is also applied to a contrivance in certain foreign boats and canoes, consisting of a projecting framework or arrangement of timbers for counterbalancing the heeling-over effect of the sails, which are large compared with the vessel's breadth.

Ouzel, or Ousel (ou'zl), small perching birds closely related to the thrushes. The common or ring ouzel (*Turdus torquātus*) is a summer visitant of Britain, and its specific name is derived from the presence of a broad semilunar patch or stripe of white extending across its breast. The water ouzel (*Cinclus aquaticus*) belongs to a different family. (See *Dipper*.) Ouzel is also an old or poetical name for the blackbird.

Ovaherero, a Bantu people of the South-West Africa Protectorate, related to the Ovambo. The name is applied collectively to the Herero people. They are the 'Damaras' or 'Cattle Damaras' described by early explorers.

Ovambo, or **Ovampo**, a negroid people of the South-West Africa Protectorate, inhabiting the country known as Ovamboland, south of the Kunene River and north of Damaraland. Ovambo is the Herero name of these tribes who call themselves Aajamba. With the Ovaherero they constitute the south-western division of the Bantu family, but the Ovambos are the cultivators and the Hereros the cattle-men of a race different from the ordinary Bantu. They have more of the Hamitic element within them, whereas in the ordinary Bantu the Arab or Semitic element predominates. The two Ovambo dialects, Kwanyama and Ndonga, are common also to South Angola, where some Ovambos are found.—Cf. E. H. L. Schwartz, *A South African Geography*.

Ovar′, a town of Portugal, district of Beira, near the Atlantic, on the north shore of the Bay of Aveiro. It has valuable fisheries and considerable trade. Pop. 10,500.

Ova′rian Tumour, a morbid growth in the ovary of a woman, sometimes weighing as much as 30, 50, or upwards of 100 lb. or more, consisting of a cyst containing a thin or thick ropy fluid, causing the disease known as *ovarian cyst*, which is now generally cured by the operation of ovariotomy.

Ovariot′omy, the operation of removing the ovary, or a tumour in the ovary (see above); a surgical operation first performed in 1809, and long considered exceedingly dangerous, but now performed with great and increasing success, especially since the adoption of the antiseptic treatment inaugurated by Lister.

O′vary, or **Ovarium**, the essential part of the female generative apparatus in which the ova or eggs are developed. The ovary in the female corresponds to the *testis* of the male. In adult women the ovaries exist as two bodies of somewhat elliptical shape, and compressed from side to side, of whitish colour and uneven surface. They are situated one on each side of the womb, and are attached to the hinder portion of the body of the womb by two thin cord-like bands—the *ovarian ligaments*—and by a lesser fibrous cord to the fringed edge of the fallopian tube. Each ovary is about 1½ inches in length, and about 1½ drachms in weight, and contains a number of vesicles known as ovisacs or Graafian follicles, in which the ova are developed. The functions of the ovary, which only become active on the approach of puberty, are, first, the formation of ova, their maturation, and their final discharge at periodic menstrual epochs into the uterus or womb; and, secondly, the secretion of certain chemical materials or hormones which are distributed by the blood-stream throughout the body, and determine the development of the secondary sexual characters distinctive of the adult woman. The ovum may be impregnated and detained in the uterus, or pass from the body with the menstrual flow. The ovaries are subject to diseased conditions, chief among which are cancer and the occurrence of tumours and cysts.

O′vary, in botany, is a hollow case enclosing ovules or young seeds, containing one or more cells, and ultimately becoming the fruit. Together with the style and stigma it constitutes the female system of the vegetable kingdom. When sunk in and united to the floral receptacle, it is called inferior; when separate, superior.

Oven Birds, perching birds belonging to the family Dendrocolaptidæ, found in South America; typical genus, Furnarius. They are all of small size, and feed upon seeds, fruits, and insects. Their popular name is derived from the form of their nest, which is dome-shaped, and built of tough clay or mud with a winding entrance.

Over, a district of Cheshire, on the Weaver, and served by the Cheshire lines to Winsford and Over. It forms part of the urban district of Winsford, has sheep and cattle fairs, and is the centre of a salt-manufacturing industry.

Overbury, Sir Thomas, English poet and essayist, and victim of one of the most infamous crimes in history, was born in 1581, and poisoned in 1613. He was educated at Queen's College, Oxford, and was a member of the Middle Temple. In 1601 he met Robert Carr, afterwards King James's favourite, and struck up a firm friendship with him. When Carr rose to prominence, Overbury advised him in all his affairs, so that the queen nicknamed him Carr's 'governor' or tutor. In about 1611 Carr fell in love with Frances Howard, who had married the third Earl of Essex in 1606. Lady Essex sought to annul her marriage in order that she might marry Carr, and Overbury used all his influence to oppose the match. The countess contrived to get Overbury imprisoned in the Tower, and, not satisfied with that, got poison served with his food. The poison was so unskilfully administered that it caused only excruciating agony, not death. After being imprisoned three months and seventeen days, Overbury was fatally poisoned by a clyster of corrosive sublimate on 14th Sept., 1613. Ten days later the Countess of Essex's marriage was annulled, and on the following Boxing Day she was married to Carr, now Earl of Somerset. She was not accused of the murder of Overbury until 1615; she pleaded guilty and received a pardon, but her less guilty husband was imprisoned for six years, and four of her humbler accomplices were hanged. Overbury's sensational death gave an adventitious fame to his writings, which were all posthumously published. His poem *The Wife* is a smooth but undistinguished didactic poem. The *Characters*, which were first printed in the second edition of this poem, are well written, but only in part the work of Overbury.—Cf. A. Amos, *The Great Oyer of Poisoning*.

Overijssel (ō′vėr-ī-sĕl), or **Overyssel**, a province of the Netherlands; area, 1295 sq. miles. It is watered by the Ijssel, which separates it from Gelderland, and by the Vecht and its affluents. Except a strip along the Ijssel, presenting good arable and meadow land, the surface is mostly a sandy flat relieved by hillocks, and the principal industries are stock-raising and dairy-farming. Chief towns, Zwolle (capital), Deventer, Almelo, and Kampen. Pop. (1918), 435,047.

Overland Route, the quickest way from Great Britain to India. The route runs via Dover, Calais, Paris, Maçon, the Mont Cenis Tunnel, and Bologna, to Brindisi, thence by steamer to Alexandria, from there by railway to Suez, thence by steamer to the destined Indian port. The average time is from eighteen to twenty days. Alternative routes are from Marseilles or Venice by steamer to Alexandria, and thence by rail to Suez.

Overreach, in horses, an injury to the heel of the fore foot caused by the inside rim of the toe of the hind shoe. If fore shoes are too long in the branches they are frequently wrenched off. Overreach is most common in hunters and thoroughbreds, and invariably happens when galloping. On examination, the skin will be found detached from before, backwards, showing that the inside of the shoe of the hind toe causes the cut in its backward action. The remedy consists in hammering down the inside rim of the hind toe, so that it is quite smooth and bevelled off.

Overseas Possessions, Government of. Our colonial organization is based on the principle that each of our colonies should be gradually educated in self-government, and should be admitted progressively to an ever larger exercise of powers within its own borders until it eventually reaches the status of a dominion. Thus the colonies stand in an infinite variety of relations to the mother country. Excluding protectorates like Uganda or Zanzibar, where the native chiefs have a considerable share in the administration, and mandatory colonies assigned to Britain under the scheme of the League of Nations, colonies may be classified according to the degree of self-government which they possess.

1. *Colonies* not completely self-governing. Within this group there are various subdivisions, according to the degree of representative government attained. (*a*) Crown colonies proper, where the legislative and executive powers are vested in a Governor representing the Crown, e.g. Gibraltar. (*b*) Colonies where the administration is carried on by the Governor, assisted by an executive and a legislative council both nominated by the Crown, e.g. Ceylon, Falkland Islands. (*c*) Colonies possessing a legislative council wholly or partly elected, and an executive council nominated by the Crown, e.g. Jamaica.

2. *Dominions* possessing complete domestic self-government with legislative powers which, though legally controllable by the Imperial Parliament, are unrestricted within their own territories. In the dominions there is a Governor-General appointed by the Crown, and there are generally two legislative chambers and a ministry selected as under the English party system.

Legislature.—The only restrictions on the legislative autonomy of the dominions are these. (1) They are subject to any Act of the Imperial Parliament whose provisions are declared in the Act to be applicable to them. (2) Any provision in a statute passed by the legislature of any colony which is repugnant to any imperial statute applying to the colony is void in terms of the Colonial Laws Validity Act, 1865. (3) The measures of all colonial legislatures are subject to veto by the Crown which may on the advice of the Colonial Secretary be exercised by an Order in Council within a period of two years, and that even although the Governor has given his assent. All measures passed by colonial legislatures must receive the Governor's assent. In general this is not refused, but if the interests of the mother country are involved and may sustain detriment, it is his duty to exercise his veto even in opposition to his ministers. Again, in the case of certain Bills he is required to reserve them for consideration of the Crown, or, while assenting, to suspend their operation pending their approval by the Crown.

Administration.—While in Crown colonies executive power is exercised by the Governor subject only to the control of the Colonial Office, self-governing colonies have virtually full autonomy in internal affairs. The position of the Governor in these approximates to that of a constitutional sovereign, as he acts with the advice of local ministers, and personally interferes but little except when imperial interests are involved. In law, however, the legislative and executive powers of dominions do not extend to external relations. They cannot conclude treaties without the consent of the Imperial Government, though in the case of Canadian treaties with the United States this rule was not observed, as Canadian interests only were involved.

Judiciary.—The appointment of judges in colonies which are not self-governing is vested in the Crown. The sole remaining judicial link between the dominions and the mother country is provided in the Judicial Committee of the Privy Council, which still exercises the royal prerogative of hearing appeals from all courts, superior as well as inferior, in the British colonies. Where no appeal lies as of right, a petition must first be presented to the Crown for leave to appeal, and this will not in general be granted in civil cases unless such leave is in accord with the rules in force in the colony, and in criminal cases unless there has been *prima facie* a gross miscarriage of justice in the colonial courts.

Even before 1914 the progressive principle on which the relation of the mother country to the colonies was based made a sharp contrast between the formal legal tie, which tended to become theoretical, and the virtual independence which the dominions in fact exercised. The necessities of the European War accelerated tendencies already long at work. The sense of imperial solidarity has been quickened, and with it the consciousness that the British Empire is a union of independent nations whose interrelation can no longer be served by the old machinery devised to meet the case of colonies which had not developed into dominions. The march of events has seemed to point the way for a permanent constitutional machinery which would at once preserve the unity of the empire and, while maintaining the independence of the dominion in matters of purely local interest, would admit them to a real participation as equal members in an imperial commonwealth in the control of policy which affected all its parts. A decisive step in this direction was the summons of representatives from the dominions to attend an Imperial Cabinet in London in 1917, and in the same year the meeting of an Imperial War Conference at the Colonial Office. The vital part played by the dominions in the European War, and the sacrifices which they had voluntarily undertaken in the cause of international freedom, conferred on them an equitable if not a strictly legal right to be consulted in the final settlement. Thus the dominions were accorded full status with regard to representation at the Peace Conference, and became signatories of, and ratified, the Treaty of Versailles on the authority of their own Parliaments. Finally, they have been admitted to full membership in the League of Nations.

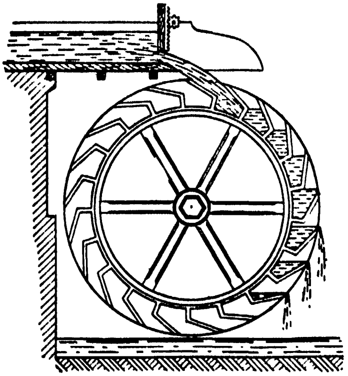
The system of representative government in the colonies was first applied in Canada in 1867, and was successively extended to New Zealand, New South Wales, Victoria, Tasmania, Newfoundland, Queensland, Cape Colony, West Australia, Natal, the Transvaal, and Orange River Colony. A new era was opened in 1900, when the first step towards *intercolonial federation* was taken in the formation of the Commonwealth of Australia, followed in 1909 by the Union of South Africa.

It may be instructive, as illustrating the extent to which the principle of self-government has been realized in the British Empire, to summarize the main features in the constitutional position of some of the dominions. In the Commonwealth of Australia the legislative power is vested in the king and a Federal Parliament consisting of a Senate and a House of Representatives. The Senate, on the principle of equality, is composed of six members from each of the states, elected for six years, while the members of the Lower House are elected according to the electoral laws of the various states. If a Bill introduced in the Lower House has been twice rejected in the Senate, the Government may dissolve both Houses of Parliament, and if, after an election, the new Senate again reject the measure, both Houses sit together as one Assembly, and a decision is reached by a simple majority. If any measure proposing to amend the Constitution is twice rejected by the Senate, it is submitted to a referendum in which a majority of votes in a majority of states is decisive. The executive power is vested in the Governor-General, assisted by a Cabinet composed of the heads of the administrative departments, who must all be members of the legislature. The supreme judicial power is vested in a federal court called the High Court of Australia. This court is the guardian of the Constitution, and the arbiter of the limits under the Constitution of the powers of the Commonwealth and the several states, and it may certify that certain questions ought to be referred to the King in Council.

In the Union of South Africa the executive power is vested in the king in person or his representative the Governor-General, appointed by the Imperial Government to hold office during the royal pleasure, and assisted by an executive council of ministers. The legislative power is exercised by the king, a Senate, and a representative House of Assembly. The Senate consists of 40 members, 8 being nominated by the Crown and 8 by each of the four provinces, holding office for ten years. The House of Assembly contains 121 members, elected for five years, coloured subjects being barred from membership. A measure rejected by the Senate in two successive sessions is submitted to a joint session of the Upper and Lower Houses for final decision. Parliament has full powers to make laws for the peace, order, and good government of the Union. The veto of the Governor on its legislation is in practice virtually obsolete. The provinces are provided with councils which resemble English county councils, and exercise certain limited legislative powers delegated to them by the Union Parliament. The supreme judicial power is exercised by the Supreme Court of South Africa, appointed by the Governor-General in Council, with original and appellate jurisdiction. There is in general no appeal from the Supreme Court of South Africa to the King in Council, but the South Africa Act, 1909, reserves right to the King in Council to grant " special leave to appeal from the Appellate Division of the Supreme Court to the King in Council ".

Overseers, public officers appointed annually in every parish of England and Wales, whose primary duty it is to assess the inhabitants for the poor-rate, collect the same, and apply it to the relief of the poor. The office, instituted in 1601, is compulsory, and entirely gratuitous; but several classes of persons, such as peers, members of Parliament, clergymen, Dissenting ministers, barristers, attorneys, doctors, military and naval officers, and others whose avocations require continual personal attendance, are exempt from serving. Numerous miscellaneous duties, other than their original duty of relieving the poor, are now imposed, by statute, on overseers. Thus they have to draw up the lists of all those entitled to vote for members of Parliament, of those qualified to serve as jurors and as parish constables, &c. In the larger parishes it is customary for the inhabitants to appoint assistant overseers, salaried officials who relieve the annual overseers to some extent of their duties.—Cf. Sir G. Nicholls, *History of the English Poor Law*.

Overshot Wheel, a type of water-wheel which receives the water at or near the highest point in its circumference, and rejects it at the lowest point of the descent. The vanes are sometimes made of wood in two parts, the outer being shaped to the line of the stream at inlet, and the inner part being radial. Metal vanes with a continuous curvature are also used. The water acts principally by its gravity, though some effect is of course due to the velocity with which it arrives. The overshot wheel is very suitable for small powers and heads of from 15 to 50 feet.


Overshot Wheel

O'verture, in music, an introductory symphony, chiefly used to precede great musical compositions, as oratorios and operas, and intended to prepare the hearer for the following composition, properly by concentrating its chief musical ideas so as to give a sort of outline of it in instrumental music. This mode of composing overtures was first conceived by the French. Overtures are, however, frequently written as independent pieces for the concert-room.

Ovid (Publius Ovidius Naso), Roman poet, was born 43 B.C., and died A.D. 17. He belonged to a wealthy equestrian family of Upper Italy, and received the education which was usual in the case of men of that class. He studied rhetoric at Rome and qualified as a barrister, but was more noted for his eloquence than for being learned in the law. He held several minor public appointments, but his love of ease was stronger than his ambition, and as he was well-to-do he soon gave up law for poetry. From his earliest days he had a fatal facility in verse-writing; as he says himself, " Whatever I endeavoured to say was verse ". He became the unofficial Poet Laureate of the dissolute and heartless court circle. In spite of his wonderful fecundity he was thirty years old before he published his first book, the *Amores*. This is a collection of love-poems, many of which are addressed to a lady named Corinna, probably a courtesan. There is no passion in these poems, but there is plenty of easy and graceful writing. The *Medicamina formæ*, a poem upon cosmetics, does not rise above the banality of its subject. The *Heroides*, letters from heroines of poetry and legend to their husbands or lovers, is a much better piece of work. In it Ovid displays not merely his usual gifts of ease and excellent style, but a deep knowledge of women's hearts. It is believed that the last six of these epistles are not genuine. Ovid's most famous or infamous work is his *Ars Amatoria* (Love-making as a Fine Art), a kind of handbook to the art of seduction. This has been described as the most immoral though not the most demoralizing poem in the world. It is entirely free from all morbid sentiment, and is full of worldly wisdom and a not at all unkindly humour. Its nearest counterpart in English is *Don Juan*. The *Remedia Amoris* was intended to be a kind of antidote to the *Ars Amatoria*. It is no better in its morality than its predecessor, and is very decidedly less interesting. Ovid intended the *Metamorphoses* to be his *magnum opus*, though he did not give it its final polish. It is a long poem in fifteen books, and relates all the mythological tales which have to do with transformations. It begins with the transformation of Chaos into Cosmos, and ends with the metamorphosis of Julius Cæsar into a star. It is a formidable task to read this poem through, but it has passages of great beauty, and as a storehouse of mythology was drawn upon more freely than any other Latin poem. The *Fasti*, in six books, is an account of the Roman calendar and festivals. It was to have been in twelve books, but was not completed. Ovid makes the best of his somewhat intractable material, and the poem has good passages; but it is on the whole more valuable for the antiquarian information it conveys than for its poetical qualities. After being the fashionable poet of the smart set at Rome for thirty years, in A.D. 8 Ovid was suddenly banished to Tomi, on the Black Sea, by a mandate of the emperor. Much speculation has been made as to the exact cause of his banishment, but in spite of many ingenious and not a few absurd conjectures, it is safe to say that the true story will never be known, save in the unlikely eventuality of more evidence being discovered. The alleged reason for his disgrace was the publication of the *Ars Amatoria*, which had taken place ten years previously; he may also have had some share in abetting or in failing to check the misconduct of the younger Julia. Tomi was on the outskirts of the Roman Empire, and Ovid found life there unendurable. He was cut off from books, friends, and all the decencies of life. He lived in hope of being recalled to Rome, but this was not to be. After the death of Augustus, Tiberius was equally opposed to his return, and he died heartbroken after nearly ten years of exile. Ovid wearied for Rome when at Tomi, and has succeeded in handing on some of his weariness to those who read the poems which he wrote there, the *Tristia* and *Epistulæ ex Ponto*. They are monotonous reiterations of complaints, and are mainly inspired by home-sickness. Ovid had all Horace's egoism without Horace's saving grace of humour. His other works include the *Ibis*, an elegiac invective, and the *Halieutica*, a didactic poem on the natural history of fishes. Among his lost works are a *Medea*, which is praised by Quintilian, and an encomium upon Augustus written in Gothic, which would have been of the greatest philological interest if it had been preserved.

As a poet Ovid occupies a peculiar position. He wrote with a fluency that was detrimental to his work, and was, as Quintilian says, too indulgent as a self-critic. As an elegiac poet his work ranks below that of Propertius and Tibullus; but as a writer of narrative verse he stands not only far above them, but above almost everyone save only Homer. His poetry has been immensely influential, far more so than that of the other elegiac poets, more so than even that of Horace and Virgil. He has, perhaps, always been more popular with poets than with scholars. Tasso, Ariosto, Chaucer, Spenser, and Milton—these are but a few of those who are followers of Ovid. Very noticeable is his influence upon Shakespeare, of whom Francis Meres wrote in 1598: "The sweete wittie soule of Ovid lives in mellifluous and hony-tongued Shakespeare". He cannot be ranked with the world's greatest poets, but he must stand in a prominent place on account of his great narrative gifts, and his influence upon poets more highly endowed than himself.—BIBLIOGRAPHY: W. Y. Sellar, *Roman Poets of the Augustan Age*; G. Boissier, *L'Opposition sous les Césars*; Nageotte, *Ovide, sa vie, ses œuvres*; A. Church, *Ovid* (Ancient Classics for English Readers Series).

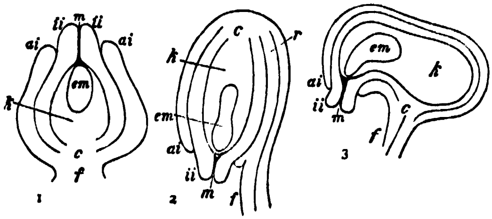
Oviedo, a maritime province of Northern Spain, on the Bay of Biscay, co-extensive with the ancient Kingdom of Asturias. It is cut up by spurs of the Cantabrian Mountains, and is drained by the Navia and the Nalon (with the Narcea). The eastern districts are served by a coastal railway from Santander to Villaviciosa and Gijon; the line from Valladolid runs to Oviedo and the coast, and has branch systems serving the central districts. The Nalon Valley coal-field is the first in Spain. Sardines and tunny are exported. Horses are raised. Oviedo is traversed by the famous Madrid-Gijon *Camino Real*, built by Charles V. Area, 4205 sq. miles; pop. (1919), 717,720.

Oviedo (ō-vi-ā'dō), a city of Spain, capital of a province of same name. Oviedo was founded by King Fruela I (756–768). It has a cathedral (rebuilt between 1388 and 1528), a church built by Ramiro I (1035–63), and a university dating from 1604. Its manufactures include hats, arms, textiles, and leather goods. Pop. (1919), 55,460.

Ovipos'itor, an appendage attached to the abdominal segments of certain insects, and used for placing the eggs in situations favourable to their due development, this being sometimes in bark or leaves, or even in the bodies of other animals. The sting of bees, wasps, &c., is a modification of an ovipositor or homologous structure.

Ov'olo, in architecture, a convex moulding, generally a quarter of a circle; but in classic architecture there is usually a departure from the exact circular form to that of an egg: hence the name (Lat. *ovum*, an egg).

Ov'ule, the megasporangium of Flowering Plants, which ripens into the seed. A typical ovule consists of a solid central portion, the *nucellus*—the megasporangium proper, enclosing the *embryo-sac* (megaspore)—invested by one or more often two coats, the *integuments*, which do not completely cover it, but leave a narrow channel (*micropyle*) open at the apex for the entrance of the pollen-tube. The ovule is attached to the placenta of the carpel by a stalk, the *funicle*, the point of junction of which with the nucellus is termed the *chalaza*. Ovules are rarely straight (orthotropous), most often doubled back on the funicle (anatropous), sometimes curved around the middle (campylotropous), or with their long axis at right angles to the funicle (amphitropous).



Ovules

1, Orthotropous. 2, Anatropous. 3, Amphitropous. *k*, Nucellus. *ii*, Inner integument. *ai*, Outer integument. *m*, Micropyle. *f*, Funiculus. *c*, Chalaza. *em*, Embryo-sac. *r*, Raphe.

Ovum, the ' egg ' or female germ-cell, which, after being fertilized by fusion with it of a minute male germ-cell (sperm), is capable of developing into a new and independent being. The essential parts to be recognized in the structure of every true ovum consist, firstly, of an outer membrane known as the *vitelline membrane*. Within this are the *vitellus* or *yolk* (cytoplasm), and the *germinal vesicle* (nucleus) containing the *germinal spot* (nucleolus). See *Ovary*; *Reproduction*.

Owen, John, English Nonconformist divine, born at Stadham, Oxfordshire, in 1616, died in 1683. He studied at Oxford, and during the Civil War took part with the Parliament. He was appointed to preach at Whitehall the day after the execution of Charles I; accompanied Cromwell in his expeditions both to Ireland and Scotland; in 1651 was made Dean of Christ Church, Oxford; and in 1652 was nominated by Cromwell, then chancellor of the university, his vice-chancellor, offices of which he was deprived in 1657. Owen was a man of great learning and piety, of high Calvinistic views, and the author of numerous works, the most permanently valuable of which is his *Exposition of the Epistle to the Hebrews*.

Owen, John, Welsh writer of Latin epigrams, was born about 1563, and died in 1622. He was educated at Winchester and New College, Oxford. He became eventually headmaster of King Henry VIII's School, Warwick. His Latin epigrams are divided into twelve books, the first four of which were published in 1606, and the rest at four different times. They became immensely popular in England and Scotland, and won an even wider fame on the Continent. Owen was commonly considered the equal, if not the superior, of Martial. His epigrams were translated into English, French, German, and Spanish. They are extremely clever epigrams, and contain much of Martial's wit, though they have none of his poetry. Owen was a stalwart Protestant, and one of his epigrams is said to have lost him an inheritance from a Catholic uncle, and to have caused his works to be placed on the *Index Prohibitorius*. It is as follows:

An Petrus fuerit Romæ, sub iudice lis est;
Simonem Romæ nemo fuisse negat.

Another very famous line was popularized though not written by Owen, who adapted it from a line of Matthew Borbonius. It is:

Tempora mutantur, nos et mutamur in illis,

and is often erroneously ascribed to Virgil or Ovid.

Owen, Sir Richard, British scientist, born at Lancaster 1804, died in 1892. Educated at Lancaster Grammar School and the medical schools of Edinburgh, Paris, and London, he became assistant curator of the Hunterian Museum. In 1834 he was appointed professor of comparative anatomy at St. Bartholomew's Hospital; in 1836 professor in anatomy and physiology at the Royal College of Surgeons; and in 1856 superintendent of the natural history department in the British Museum, from which last post he retired in 1883. Owen was the greatest palæontologist since Cuvier, and as a comparative anatomist was a worthy successor to Hunter. He was a voluminous writer on his special subjects, and an honorary Fellow of nearly every learned society of Europe and America. Among his works are: *Lectures on the Comparative Anatomy of the Invertebrate Animals*, *Lectures on the Comparative Anatomy of the Vertebrate Animals*, *History of British Fossil Mammals and Birds*, *History of British Fossil Reptiles*, *Principles of Comparative Osteology*, *On the Anatomy of Vertebrates*, *The Fossil Reptiles of South Africa*, and *The Fossil Mammals of Australia*.

Owen, Robert, British philanthropist and social reformer, born at Newtown, Montgomeryshire, North Wales, in 1771, died there 1858. Early distinguished by his business talents, at the age of eighteen he became manager of a spinning-mill at Chorlton, near Manchester, and subsequently of the New Lanark cotton-mills, belonging to David Dale, a wealthy Glasgow manufacturer, whose daughter he married. Here Owen introduced many important reforms, having for their object the improvement of the condition of the labourers in his employ. In 1812 he published *New Views of Society, or Essays upon the Formation of Human Character*; and subsequently a *Book of the New Moral World*, in which he completely developed his socialistic views, insisting upon an absolute equality among men. He had three opportunities of setting up social communities on his own plan—one at New Harmony in America, another at Orbiston in Lanarkshire, and the last in 1844, at Harmony Hall in Hampshire, all of which proved signal failures. In his later years Owen became a firm believer in spiritualism.—Cf. Lloyd Jones, *Life of Robert Owen*.

Owensboro, a city of Kentucky, United States, the county seat of Daviess county, on the Ohio; served by the Louisville & Nashville, the Illinois Central, and the Louisville, Henderson, & St. Louis Railways. It is a tobacco centre, with a large river trade and manufactures of wood and flour. Oil is found, and cattle are raised in the vicinity. Owensboro was founded in 1798 as Yellow Banks, and became a town under the name of Rossborough in 1816. In 1818 'Owensboro' was adopted, and Owensboro became a city in 1866. Pop. (1920), 17,427.

Owl Parrot (*Stringops habroptĭlus*), the type and only known representative of a peculiar group of the parrot family, is a large bird, a native of the South Pacific Islands, and especially of New Zealand. In aspect and in nocturnal habits it resembles the owl. It feeds on roots, which it digs out of the earth with its hooked beak. It seldom flies; it is generally to be seen resting in hollow stumps and logs, and is said to hibernate in caves.

Barn Owl (*Strix flammĕa*)

Long-eared Owl (*Asio otus*)

Owls, a group of birds forming a well-defined family (Strigidæ), including nocturnal birds of prey. The head is large and well covered with feathers, part of which are generally arranged around the eyes in circular discs, and in some species form horn-like tufts on the upper surface of the head. The beak is short, strongly curved, and hooked. The ears are generally of large size, prominent, and in many cases provided with a kind of fleshy valve or lid, and their sense of hearing is exceedingly acute. The eyes are very prominent and full, and project forwards, the pupils being especially well developed—a structure enabling the owls to see well at dusk or in the dark. The plumage is of soft downy character, rendering their flight almost noiseless. The tarsi are feathered, generally to the very base of the claws, but some forms, especially those of fish-catching habits, have the toes and even the tarsi bare. The toes are arranged three forwards and one backwards; but the outer toe can be turned backwards at will, and the feet thus converted into hand-like or prehensile organs. In habits most species of owls are nocturnal, flying about during the night, and preying upon the smaller quadrupeds, nocturnal insects, and upon the smaller birds. Mice in particular form a large part of their food. During the day they inhabit the crevices of rocks, the nooks and crannies of old or ruined buildings, or the hollows of trees; and in these situations the nests are constructed. Owls vary greatly in size, the smallest not being larger than a thrush. In their distribution they occur very generally over the habitable globe, both worlds possessing typical representatives of the group. The common white or barn owl (*Strix flammĕa*) is the owl which has the greatest geographical range, inhabiting almost every country in the world. The tawny brown or wood owl (*Syrnium aluco*) is the largest of the species indigenous to Britain, and is strictly a woodland bird, building its nest in holes of trees. The genus *Asio* contains the so-called horned owls, distinguished by elongated horn-like tufts of feathers on the head. The long-eared owl (*Asio otus*) appears to be common to both Europe and America. It inhabits woods. The short-eared owl (*Asio accipitrīnus*) frequents heaths, moors, and the open country generally to the exclusion of woods. It has an enormous geographical range. The eagle owl (*Bubo ignāvus*) is rare in Britain, but occurs in Norway, Sweden, and Lapland, and over the continent of Europe to the Mediterranean. A similar species (*B. virginianus*) extends over the whole of North

America. Owls of diurnal habits are the hawk owl (Surnia) and the snowy owl (Nyctea). The hawk owl mostly inhabits the Arctic regions, but migrates southwards in winter, as does the snowy owl, which is remarkable for its large size and snowy plumage. The little owl (*Carine noctua*), the bird of Pallas Athena, is spread throughout the greater part of Europe, and has been introduced into Britain. One of the most remarkable of owls is the burrowing owl (*Speotyto cunicularia*) of America and the West Indies, which inhabits the burrows of the marmots (q.v.) or prairie-dogs—the owls possessing themselves of these burrows and breeding therein, much to the discomfort of the original possessors of the abodes.

Ox, the general name of certain well-known ruminant mammals, family Bovidæ (Cavicornia). The characters are: the horns are hollow, supported on a bony core, and curved outward in the form of crescents; there are six incisor teeth in the under jaw and two canines of similar shape, but no incisors nor canines in the upper; the naked muffle is broad. Typical species are *Bos taurus*, or common ox; *B. bonasus*, aurochs, or bison of Europe; *B. americanus*, or buffalo of North America; *B. bubalus*, or proper buffalo of the eastern continent; *B. caffer*, or Cape buffalo; *B. grunniens*, or yak of Tibet, &c. The name ox is used also in a more restricted sense to signify the male of the bovine genus (*Bos taurus*) castrated, and full-grown, or nearly so. The young castrated male is called a *steer*. He is called an *ox-calf* or *bull-calf* until he is a year old, and a *steer* until he is four years old. The same animal not castrated is called a *bull*. Besides the European ox there are several other varieties, as the Indian or zebu, with a hump on its back, the Abyssinian, Madagascar, and South African. See *Cattle*, *Bison*, *Buffalo*, *Yak*, &c.

Oxalic Acid ($H_2C_2O_4$), a dibasic acid which occurs in a few plants in the free state, but more generally as the acid potassium salt, e.g. in wood-sorrel, rhubarb, &c., or as calcium salt in certain lichens. The pure acid may be prepared by oxidizing cane-sugar with nitric acid; various other complex compounds, like starch and cellulose, also yield the acid on oxidation. It is manufactured mostly from potassium formate, which on heating decomposes, yielding potassium oxalate and hydrogen. It crystallizes in large transparent, four-sided prisms of composition $H_2C_2O_4.2H_2O$. The water of crystallization is readily removed when the crystals are heated to 60°–70° C., giving anhydrous oxalic acid. It is soluble in water, and forms a series of salts with the metals known as the oxalates, some of which are of industrial importance. Binoxalate of potassium, KHC_2O_4, familiarly known as ‘salts of sorrel’ or ‘salts of lemon’, is used in the removal of iron mould from wood and linen; ferric oxalate, $Fe_2(C_2O_4)_3$, is used in photography; and oxalic acid is used in certain types of calico-printing and for whitening leather, &c. Both the acid and its salts are violent poisons.

Oxalida'ceæ, a natural order of polypetalous dicotyledons, of which the genus Oxălis or wood-sorrel is the type, comprising herbs, shrubs, and trees, remarkable, some of them, for the quantity of oxalic acid they contain. Some American species have tuberous edible roots. For two species see *Blimbing* and *Carambola*.

Oxenstjerna, Axel, Count, Swedish statesman, born 1583, died in 1654. He studied theology at Rostock, Wittenberg, and Jena; and in 1602 returned to Sweden and entered the service of Charles IX. On the accession of Gustavus Adolphus, in 1611, he was made Chancellor. He accompanied his king during his campaigns in Germany, taking charge of all diplomatic affairs; and on the fall of his master at Lützen (1632) he was recognized, at a congress assembled at Heilbronn, as the head of the Protestant League. In 1645 he assisted in the negotiations with Denmark at Bromsebro, and on his return was created count by Queen Christina, whose determination to abdicate the crown he strongly but unsuccessfully opposed.

Oxford, a city and county town of England, capital of Oxfordshire, and seat of one of the most celebrated universities in the world. It is situated on a gentle acclivity between the Cherwell and the Thames, here called the Isis, and is served by the Great Western and the London & North-Western Railways from London and Reading. Oxford, as a city of towers and spires, of fine collegiate buildings old and new, of gardens, groves, and avenues of trees, is unique in England. The oldest building is the castle keep, built in the time of William the Conqueror and still all but entire. Of the numerous churches the first is the Norman cathedral, begun about 1160. It not only serves as the cathedral of Oxford diocese, but also forms part of the collegiate buildings of Wolsey's foundation of Christ Church, of which the head is dean of the diocese. Other churches are St. Mary's, used as the University Church, with a tower and spire (dating about 1400); All Saints', the city church (eighteenth century), with a Græco-Gothic spire; St. Giles's (twelfth and thirteenth century); and St. Barnabas, a modern building. Of the university buildings the most remarkable are Christ Church, the largest and grandest of all the colleges, with a fine quadrangle and other buildings, a noble avenue of trees (the Broad Walk), the cathedral serving as its chapel; Magdalen College, considered to be the most beautiful and complete of all; Balliol College, with a modern front (1867–9) and a modern Gothic chapel; Brasenose College; and New College (more than 500 years old), largely consisting of the original buildings, and especially noted for its gardens and cloisters; besides the Sheldonian Theatre, a public hall of the university; the new examination schools, new museum, Bodleian Library, Radcliffe Library, and other buildings belonging to the university. (See *Oxford University.*) Oxford depends mostly on the university, and on its attractions as a place of residence.

The history of the town of Oxford begins in 912, when it was occupied by Edward the Elder, King of the West Saxons. The town received a charter from King Henry II, granting the citizens the same privileges and exemptions as those enjoyed by the capital. During the seventeenth century Parliaments were often held at Oxford, and in the seventeenth century it was again prominent in history as the headquarters of the Royalist party. It sends one member to the House of Commons. Pop. (1921), 57,052.—BIBLIOGRAPHY: A. Lang, *Oxford*; C. Headlam, *The Story of Oxford.*

Oxford Clay, in geology, a bed of dark-blue or blackish clay, interposed between the Bath and Coralline, so called from its being well developed in Oxfordshire.

Oxford Movement, The, has been described as a revival of that conservative, patristic, sacramental form of Anglican piety and theology of which Laud was the precursor and Andrewes the typical representative. Its immediate cause was the supposed menace to religion of the contemporary religious and political 'liberalism'. For the movement took shape in an age when the spirit of freedom was at once asserting itself within the Church of England, and setting itself against it—the age, namely, both of the 'Broad Church' theology and of the Catholic Emancipation Act and the Reform Bill. In a sermon preached from the university pulpit at Oxford on 14th July, 1833, John Keble sought to arouse the Church to the danger of the situation. That sermon, according to John Henry Newman, marks the beginning of the Oxford Movement. But the real, as distinguished from the formal, beginning was largely due to Newman himself, and took place in Sept., 1833, when there appeared the first of the *Tracts for the Times by Members of the University of Oxford.* Of the ninety tracts issued between 1833 and 1841 a large proportion came from Newman's own pen. During those years Newman was the most influential leader of the movement. Edward B. Pusey was second to him in prominence among the 'Tractarians', and on his withdrawal from participation in the movement succeeded him in the leadership. The 'Tractarians' and their followers became known indeed as 'Puseyites'. Newman's withdrawal was occasioned by the storm of indignation and controversy that greeted the appearance in 1841 of his famous *Tract No. 90*, in which he showed pronounced sympathy with Romanism as against Protestantism. His secession to Rome in 1845 may be said to mark the end of the movement. But the influence of the movement upon the Church of England, and upon the Anglican Church generally, has been deep and lasting. It has not only served to revive the Anglo-Catholicism of the days of Bishop Andrewes on the side of doctrine, it has revived it also on the side of worship, by its restoration of ritual and stately ceremonial.—BIBLIOGRAPHY: R. W. Church, *The Oxford Movement, 1833–45*; J. H. Newman, *Apologia pro Vita Sua*; J. A. Froude, *The Oxford Counter-Reformation* in *Short Studies on Great Subjects*; S. L. Ollard, *Short History of the Oxford Movement.*

Oxfordshire, a south-midland county of England. It is bounded by Northampton, Warwick, Gloucester, Berks, and Buckingham; area, 479,220 acres. The southern part of the county presents alternations of hill and dale, the former, particularly the Chiltern Hills, being beautifully varied with fine woods, tracts of arable land, and open sheep downs. The central parts are more level, and are also adorned by numerous woods. The Great Western, Great Central, and London & North-Western Railways serve the county, which is intersected by the Oxford Canal. Dairy-farming is largely practised, and great quantities of butter are made. Manufactures are of little importance. The principal rivers are the Thames or Isis, Thame, Evenlode, Cherwell, and Windrush. The abbreviated title for Oxfordshire is Oxon. Pop. (1921), 189,558.

Oxford University, one of the two great English universities, established in the Middle Ages, and situated in the city of Oxford (q.v.). Like Cambridge it embraces a number of colleges forming distinct corporations, of which the oldest is believed to be University College, dating from 1253, *though Merton College was the first to* adopt the collegiate system proper. The following list contains the name of the colleges, with the date at which each was founded:

1. University College	1253
2. Balliol College	1268
3. Merton College	1274
4. Exeter College	1314
5. Oriel College	1326
6. Queen's College	1340
7. New College	1379
8. Lincoln College	1427
9. All Souls' College	1437
10. Magdalen College	1458
11. Brasenose College	1509
12. Corpus Christi College	1516
13. Christ Church	1546
14. Trinity College	1554
15. St. John's College	1555
16. Jesus College	1571
17. Wadham College	1612
18. Pembroke College	1624
19. Worcester College	1714
20. Keble College	1870
21. Hertford College	1874

Of the so-called 'Halls', which were similar institutions, but differing from the colleges in not being corporate bodies, only St. Edmund Hall now remains.

Oxford University is an institution of quite the same character as that of Cambridge. Most of the students belong to and reside in some college (or hall), but since 1869 a certain number have been admitted without belonging to any of these institutions. The students receive most of their instruction from tutors attached to the individual colleges, and those of each college dine together in the college hall and attend the college chapel. The ordinary students are called 'commoners'. The style or title by which the corporation is known is The Chancellor, Masters, and Scholars of the University of Oxford. The head of the university is the Chancellor. The chief governing bodies are the House of Convocation, the Congregation of the University, and the Hebdomadal Council. The House of Convocation, which includes all Doctors and Masters whose names are on the register, elects to nearly all the offices in the gift of the university; gives the final sanction to all new statutes; transacts nearly all the formal business of the university as a corporate body; and elects the parliamentary representatives. The Congregation of the University, which includes professors and other officials and all resident members of Convocation, can amend, confirm, or reject legislative proposals laid before it, but all these must originate with the Hebdomadal Council, which consists of about twenty members, partly official, but mostly elected, and which meets every week in term time. The office of Chancellor is almost purely honorary; the Vice-Chancellor is in fact the supreme executive and judicial authority of the university. Two proctors are chosen yearly to maintain the discipline of the university. The university is open, without respect of birth, age, or creed, to all who have passed the necessary examinations or other tests. Students enter as commoners or as 'scholars' or 'exhibitioners', according as they obtain some of the numerous scholarships or exhibitions which may be competed for. There are four terms or periods of study, known as Michaelmas, Hilary or Lent, Easter, and Trinity or Act. The two last have no interval between, so that the terms of residence are three of about eight weeks each. The degrees conferred are those of Bachelor and Master of Arts, Bachelor and Doctor of Letters, Science, Music, Medicine, Civil Law, and Divinity. Twelve terms of residence are required for the degree of B.A. No further residence is necessary for any degree, and no residence whatever is required for degrees in music. Candidates for the degree of B.A. must pass three distinct examinations: Responsions (known among undergraduates by the designation 'Smalls') before the masters of the schools; first public examination before the moderators ('Moderations'); and the second public examination before the public examiners ('Schools'). If the student wishes to take his degree with 'honours', a residence of four years is usually necessary. Honours may be taken in *literæ humaniores* (classics), English language and literature, mathematics, jurisprudence, modern history, theology, natural science, and Oriental studies. Any B.A. may proceed to the degree of M.A., without further examination or exercise, in the twenty-seventh term from his matriculation, provided he has kept his name on the books of some college or hall, or upon the register of unattached students for a period of twenty-six terms. In the case of all other degrees (except honorary ones) some examination or exercise is necessary. Women were admitted to the examinations in 1884, and were first given degrees in 1920. Three colleges for women have been established: Somerville Hall, Lady Margaret Hall, and St. Hugh's Hall. Mansfield College, for the education of men for the Nonconformist ministry, was established in 1888. The total number of students is about 4200. The total number of professorships, &c., in the university is about a hundred. The total annual revenues are between £400,000 and £500,000. The institutions connected with the university include: the Bodleian Library (the second in the kingdom), the Ashmolean Museum, Botanic Gardens, Taylor Institution for modern languages, University Museum, Radcliffe Library, Observatory, and Indian Institute. Since 1604 the University has sent two members to Parliament.—BIBLIOGRAPHY: H. C. Maxwell-Lyte, *History of the University of Oxford*; G. C. Brodrick, *History of the University of Oxford*; J. Wells, *Oxford and Oxford Life*; Hastings Rashdall, *History of Universities in the Middle Ages*.

Oxides, the compounds of oxygen with other elements. The elements, with the exception of fluorine, bromine, and the gases of the argon group, all unite with oxygen directly or indirectly to form oxides. The oxides may be classified into *basic oxides*, *acidic oxides*, *neutral oxides*, and *peroxides*. The basic oxides contain metal united with oxygen, e.g. calcium oxide or quick-lime (CaO), sodium oxide (Na_2O), &c. These react with acids, forming a salt of the metal and water. Acidic oxides contain non-metals united with oxygen, e.g. sulphur dioxide (SO_2), phosphorus pentoxide (P_2O_5); these unite with a base to form a salt and water. Certain of the metals form both basic and acidic oxides; thus chromium forms a basic oxide (Cr_2O_3), chromic oxide, and an acidic oxide (CrO_3), chromium trioxide; and again some metals form oxides which have both basic and acidic properties, e.g. zinc oxide

(ZnO) reacts with acids to form a salt and water; it also dissolves in alkalis, forming a salt and water. Neutral oxides show no reaction with either acid or base, e.g. hydrogen oxide or water (H_2O), nitrous oxide (N_2O), carbon monoxide (CO). Peroxides contain an excess of oxygen which is easily liberated, e.g. hydrogen peroxide (H_2O_2), sodium peroxide (Na_2O_2), barium peroxide (BaO_2). See also articles on individual chemical elements.

Oxlip (*Primūla elatior*), a kind of primrose growing wild in East Anglia, intermediate between the primrose and cowslip, but distinct from the hybrids between these two.

Oxus, Amu, Amu Daryā, or **Jaihūn,** a large river of Central Asia, which has its sources between the Thian Shan and Hindu Kush ranges in the Pamir, flows west through a broad valley, receiving many affluents, and north-west through the deserts of Western Turkestan, bordering on or belonging to Bukhāra and Khiva, to the southern extremity of the Sea of Aral, where it forms an extensive marshy delta. It is generally held that the lower part of the course of the Oxus was at one time different from what it is now, and that the river entered the Caspian Sea. The principal head-stream of the Oxus is by some considered to be the Panja River, which rises in a lake of the great Pamir, at a height of 13,900 feet. The Oxus for a considerable distance forms the boundary between Afghanistan and Bukhāra. Total course, 1300 miles.

Oxychloride, the chloride of a metal or non-metal where part of the chlorine is replaced by oxygen, as in phosphorus oxychloride ($POCl_3$), bismuth oxychloride (BiOCl), &c.

Oxycoc'cus, a genus of plants of the nat. ord. Vacciniaceæ, commonly known as the cranberry (q.v.).

Oxygen (chemical symbol, O; atomic weight, 16·00), the most widely distributed of all the elements, $\frac{8}{9}$ by weight of water, $\frac{1}{4}$ by weight of air, and about $\frac{1}{2}$ of silica, chalk, and alumina consisting of oxygen. It exists in the atmosphere in the free state mixed with nitrogen; it enters into the constitution of most minerals and rocks; it exists in the tissues and blood of animals; it is essential to life, and all decay of organic vegetable and animal matter is carried on through its agency. Oxygen was first isolated in 1774 by Joseph Priestley, who gave the new gas the name of *dephlogisticated air*. Lavoisier the year following put forward the opinion that the new gas was identical with the substance which exists in the air, and gave it the name oxygen (from Gr. *oxys*, acid, and root *gen*, to produce) because he supposed it was present as the active constituent of all acids. Oxygen is a colourless inodorous gas; it is rather heavier than air. It is slightly soluble in water at ordinary temperature, a fact which is of importance, as the dissolved gas is the source of oxygen supply for fish and other aquatic life.

Oxygen was first liquefied by Pictet in 1877 by the application of intense cold and pressure. Liquid oxygen is a bluish transparent liquid which boils at −182·9° C. at 760 mm.; when the pressure is reduced evaporation takes place so rapidly that part of the oxygen is obtained as a hard blue solid. Chemically oxygen is very reactive, and readily unites with all the elements with a few exceptions. The union of oxygen with the elements is known as oxidation, and the compounds formed are the oxides (see *Oxides*; *Chemistry*). Some elements when brought in contact with oxygen at ordinary temperature unite with it so violently as to produce light and heat; in other cases oxidation is much slower, e.g. the rusting of iron. All phenomena of ordinary combustion or burning of substances are cases of oxidation, the substance in burning uniting with the oxygen of the air. A combustible substance is one which readily unites with oxygen.

Oxygen plays an important part in nature. In inspiring, animals receive into the lungs a supply of oxygen; this oxygen is carried by the blood to various parts of the body, and there aids in tissue-building, &c.; the deoxygenated blood returns to the lungs and again receives a supply of oxygen. Trees and green plants evolve oxygen, which is formed during decomposition of carbon dioxide absorbed from the atmosphere by the green parts of the plant. Oxygen is manufactured in considerable quantity for industrial purposes. It was formerly obtained by electrolysis of water or from barium dioxide in Brin's process, but of recent years practically all oxygen has been prepared by Linde's liquid-air process, in which oxygen is separated from liquid air by fractional distillation.

Oxygen is used in medicine and industrially for maintaining a supply of fresh air in enclosed spaces; for the production of high temperatures, oxygen mixed with hydrogen in the oxy-hydrogen flame giving a temperature sufficient to melt platinum; in oxy-acetylene welding and metal cutting; and for thickening oils.

Oxyr'ia, a genus of plants of the nat. ord. Polygonaceæ. The only species native to Great Britain is *O. reniformis* (mountain-sorrel), which is found on some of the highest mountains.

Oxyu'ris, a genus of internal parasitic thread-worms, which rapidly multiply and pass from the intestine to other organs. *O. vermiculāris*, often found in the human rectum, is usually about a quarter of an inch long.

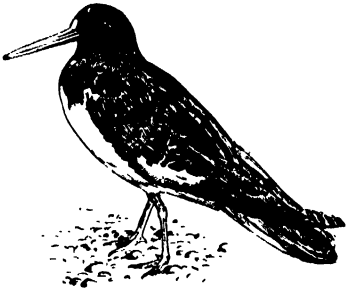
Oyer and Terminer (O.Fr. 'to hear and determine'), an Anglo-French legal term employed in English common law. It is applied to one of the commissions directed to two of the judges of the circuit and other gentlemen of the county to which it is issued, by virtue of which they have power, as the terms imply, to hear and determine certain specified offences. The commissions of oyer and terminer are the most comprehensive of the several commissions which constitute the authority of the judges of assize on the circuits.

Oyster, an edible bivalve mollusc, and a near ally of the mussels, &c. It belongs to the genus Ostrea, family Ostreidæ, the members of which are distinguished by the possession of an inequivalve shell, the one half or valve being larger than the other. The shell may be free, or attached to fixed objects, or may be simply embedded in the mud. The foot is wanting. A single (adductor) muscle for closing the shell is developed. The common oyster (*Ostrea edūlis*) is the most familiar member of the genus. The fry or fertilized ova of the oyster are termed 'spat', and enormous numbers of ova are produced by each individual from May or June to September—the spawning season. The spat being discharged, each embryo is found to consist of a little body enclosed within a minute but perfectly formed shell, and possessing vibratile filaments or cilia, by which the young animal at first swims freely about, and then attaches itself to some object. In about three years it attains its full growth. The oysters congregate together in their attached state to form large submarine tracts or 'oyster-beds', as they are termed.

Oysters are found all over the world, and are commercially the most important fishery product.

The United States and France are the chief seats of the oyster industry. In the United States the natural oyster-beds are still a source of great wealth, while in Europe the native beds have long since been practically destroyed. Large quantities of American oysters are now sent to Europe; and the American are generally larger than the European. In Europe the oyster industry has practically ceased to be oyster fishery and is now oyster culture. In Great Britain the chief centre of the industry is in the Thames estuary. In Scotland the oyster has hitherto been left pretty much to itself and to nature; hence the depopulation of the once famous beds of the Firth of Forth, and the fact that the 'Pandores' of Prestonpans are things of the past. In England, and especially in the Thames estuary, brood oysters are laid down in fattening beds, where they obtain food which gives them a peculiar thinness of shell and delicacy of flavour, and that green colour which is so much esteemed by epicures. The oysters thus laid down and bred in these situations are known as 'natives', and fetch the highest price in the market. Oyster culture is prosecuted on various parts of the coast, chiefly by private companies. The most ancient of these is the Whitstable company, which has worked its present ground on the south side of the entrance to the Thames from time immemorial. In Britain oyster-beds, being below the medium line of the tides, belong by right to the crown, and can only be claimed as private property in virtue of a royal grant. In order to prevent the total extirpation or great diminution of the supply of oysters a close season has been fixed, by a convention between England and France, applying to the seas between the two countries. The close season lasts from the 1st of May to the 31st of Aug. The pearl oyster (*Meleagrīna margaritifera*), of the Indian and Pacific Oceans, belongs to a different family.

Oyster-catcher (*Hæmatŏpus ostralĕgus*), a bird belonging to the well-known plover family (Charadriidæ), and popularly known as the 'sea-pie'. It is distinguished by its long, thin, wedge-shaped, orange-coloured bill, and its black and white plumage. It is a permanent resident in Britain, and frequents the sea-coast, where it feeds on mollusca.



Oyster-catcher (*Hæmatŏpus ostralĕgus*)

O'zark Mountains, a chain of the United States, intersecting in a south-westerly direction the states of Missouri and Arkansas; height, about 2500 feet.

Ozoke'rite, a greenish or yellowish solid mineral hydrocarbon of a pleasantly aromatic odour, existing in the bituminous beds of the coal-measures, and occurring chiefly in Galicia (Poland) and in Roumania. Small quantities of it have been found at Uphall, in Linlithgowshire, and at Urpeth Colliery, Newcastle-on-Tyne, and various other places. It contains 85 per cent of carbon and 14 per cent of hydrogen. When purified it forms a hard paraffin, from which excellent candles are manufactured. It is used to some extent as an adulterant of beeswax. See *Paraffin*.

Ozone (Gr. *ozō*, I smell) is the element oxygen in a modified or allotropic form. When heated it yields pure oxygen, and it has been shown that 2 volumes of ozone yield 3 of oxygen, and hence the formula O_3. It is a colourless gas with a characteristic odour, and may be condensed to a blue liquid at low temperatures. It is an extremely powerful oxidizing agent, readily converting copper, mercury, and silver into their oxides in the presence of moisture. When an electric machine is set in operation, a peculiar smell may be perceived; after a discharge of lightning the same smell is perceptible. The substance which manifests this odour is ozone. In industry it is used for refining palm and linseed oils, for cleansing brewers' casks, and for other purposes where an oxidizing gas is useful. It bleaches numerous substances, such as indigo and natural fibres.

P

P, the sixteenth letter and twelfth consonant in the English alphabet. It is one of the mutes and labials, and represents a sound produced by closely compressing the lips till the breath is collected, and then letting it issue. In English words beginning with *pn*, *ps*, and *pt*, *p* is silent.

Pabna′, a district and town of the Rájsháhi division, Bengal, near the Ganges; contains a large indigo factory. Area (district), 1851 sq. miles; pop. 1,500,000; (town), 19,300.

Paca, or Spotted Cavy (Cœlogenys), a genus of rodents allied to the agoutis, family Dacyproctidæ. The common paca (*C. paca*) is one of the largest of the rodents, being about 2 feet long and about 1 foot high. In form it is thick and clumsy, and the tail is rudimentary. In habits the pacas are chiefly nocturnal and herbivorous. They excavate burrows, run swiftly, and swim and dive with facility. They are found in the eastern portion of South America, from Paraguay to Surinam. The flesh is said to be savoury.

Paca (*Cœlogenys paca*)

Pace, a measure of length, used as a unit for long distances. It is derived from the Lat. *passus*, which was, however, a different measure, the Latin *passus* being measured from the mark of the heel of one foot to the heel of the same foot when it next touched the ground, thus stretching over two steps; while the British pace is measured from heel to heel in a single step. The Latin pace was somewhat less than 5 feet; the British military pace is 30 inches in *slow* and in *quick* time; in *stepping out* it is 33 inches; in *double time* 40 inches, and in *stepping short*, 21 inches.

Pachira (pa-kī′ra), a genus of tropical American trees allied to the baobab tree. The largest flowered species, *P. macrantha*, found in Brazil, attains a height of 100 feet, and has flowers 15 inches long. The plants are familiar in our hothouses under the name of *Carolinea*.

Pachman, Vladimir de, the world-famous pianist, was born at Odessa in 1848. His father, who was a noted musical amateur, was his first teacher, and Pachman followed up this early instruction by a course of study at the Conservatorium of Vienna. He made his first public appearance as a pianist in Russia in 1869, and although meeting with much success he retired for a further period of hard study, which lasted for eight years. After a short spell of public playing he again retired for two more years of study, and on reappearing was at last satisfied with his achievements. His first appearance in Britain was at London in 1882. As an interpreter he is unequal, but his renderings of Chopin, especially the more delicate works, are unrivalled, and offer memorable examples of piano-playing at its highest.

Pacho′mius, a scholar of St. Antony, born about A.D. 292. He is said to have been the first who introduced, instead of the free hermit life, the regular association of monks living in cloisters. He founded one of the first monastic institutions on Tabenna, an island of the Nile, in 318. He was also the founder of the first nunnery, and at his death is said to have had the oversight of above 7000 monks and nuns.

Pachuca, or **Hidalgo**, a city of Mexico, capital of the state of Hidalgo, in a rich silver-mining region, about 8200 feet above the sea. Pop. 39,000.

Pachyder′mata, the name formerly applied to an artificial assemblage of mammals, including the elephants, tapirs, hippopotamus, rhinoceros, swine, and hyrax—all of which forms were distinguished by their thick skin, by their non-ruminant habits, and by their possessing more than one hoof on each extremity. The group is now divided among the various sub-orders of the Ungulata. See *Ungulata*.

Pachyglossæ, a section of saurian reptiles having a thick fleshy tongue, convex, with a slight nick at the end. It includes the iguanas and agamas.

Pachyrhizus (pak-i-rī′zus), a genus of tropical leguminous plants common to both hemispheres. *P. angulatus* has fleshy roots of great length and thickness, which are used in times of scarcity as an article of diet.

Pacific Ocean (formerly called also the *South Sea*), the largest of the oceans of the globe, extending between America and Asia-Australia. It exceeds in compass the whole of the four continents taken together, and occupies more than a fourth part of the earth's area, and fully one-half of its water surface. On the west it extends to the Indian Ocean, and has several more or less distinct seas connected with it—the China Sea, Yellow Sea, Sea of Japan, Sea of Okhotsk, &c.; on the north it communicates with the Arctic Ocean by Behring's Strait, on the south it is bounded by the Antarctic Ocean, and on the east it joins the Atlantic at Cape Horn. Within this enormous circumference it includes the numerous islands composing the groups of Australasia and Polynesia, and those adjoining America and Asia. The average depth of the Pacific is greater than that of the Atlantic, and its bed is more uniform. The deepest sounding obtained in the Philippines gave a depth of nearly 5350 fathoms. The trade-winds of the Pacific are not so regular in their limits as those of the Atlantic, and this irregularity extends over a much wider region in the case of the south-east trade-wind than in the case of the north-east. The cause of this is the greater number of islands in the South Pacific Ocean, which, especially in the hot season, disturb the uniformity of atmospheric pressure by local condensations. The north-east trade-wind remains the whole year through within the northern hemisphere. The south-east trade-wind, on the other hand, advances beyond the equator, both in summer and winter, still preserving its original direction. In the region stretching from New Guinea and the Solomon Islands south-eastwards there are no regular winds. The zones of the two trade-winds are separated by regions of calms and of light winds, the limits of which vary, of course, with the varying limits of these zones. In the China seas the terrible typhoon occasionally rages, and may occur at any season of the year.

The Portuguese were the first Europeans who entered the Pacific, which they did from the east. Balboa, in 1513, discovered it from the summit of the mountains which traverse the Isthmus of Darien. Magellan sailed across it from east to west in 1520–1. Drake, Tasman, Behring, Anson, Byron, Bougainville, Cook, Vancouver, La Pérouse, and others traversed it in different directions in the seventeenth and eighteenth centuries. The principal Pacific powers are United States, Japan, and Great Britain, and the question of the control of the Pacific was discussed at Washington in 1921.

Pacinian Corpuscles, in anatomy, minute oval bodies appended to the extremities of certain nerves, especially those of the hands and feet. The function of the Pacinian corpuscles (named after Pacini, an Italian anatomist, who first described them in 1835) is probably connected with the sense of touch, but is not certainly known.

Pack′fong, a Chinese alloy of a silver-white colour, consisting (though different accounts are given of its composition) of copper, zinc, nickel, and iron. It was formerly used by watch-makers, mathematical instrument makers, and others for a variety of purposes for which nickel alloys are now employed.

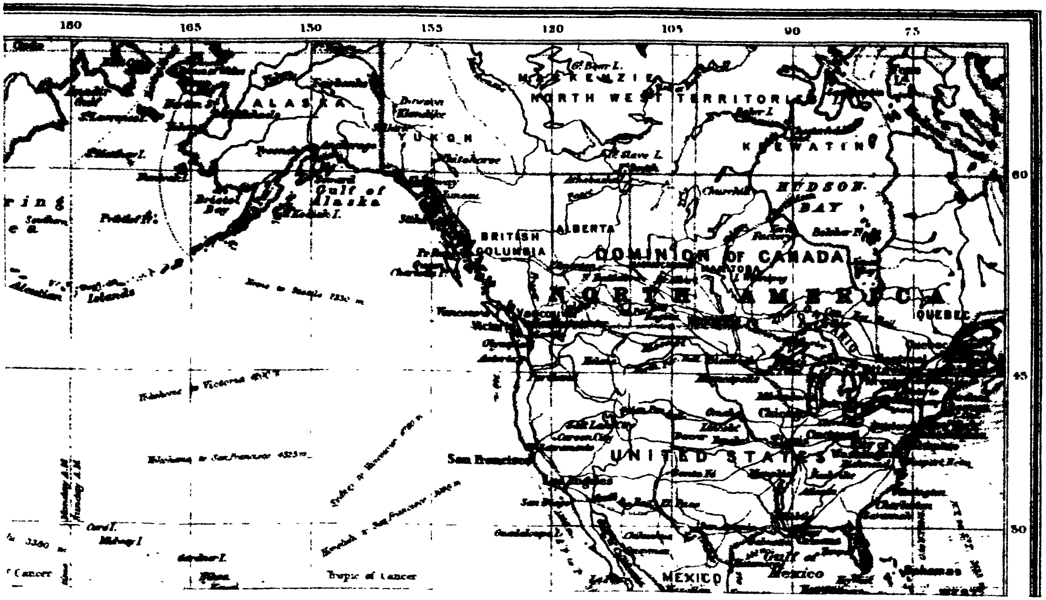
Pactum Illicitum, in Scots law, an unlawful contract, whether it be directly illegal, *contra bonos mores*, or inconsistent with the principles of sound policy.

Pacu′vius, Marcus, ancient Roman tragic poet, born at Brundusium in 219 B.C., passed the greater part of his life at Rome, where he became famous both for his poetry and his paintings, retired to Tarentum during his last years, and died at the age of ninety in 129 B.C. Only fragments of his tragedies exist.

Padang′, a seaport of Sumatra, the coastal terminus of the railway to the hinterland. It is the chief market in Sumatra for coffee and gold. Coffee, tobacco, copra, and hides are exported, and native coal is bunkered. Pop. 47,000.

Paddington, a north-western parliamentary borough of the county of London, wedged between Marylebone and Kensington, and including such districts as Maida Vale and Bayswater. It is largely residential, and has many mansions and flats around Hyde Park, in Bayswater, and near Kensington Gardens. The terminus of the Great Western Railway, familiarly known as 'Paddington', is in Praed Street. Harrow Road intersects the borough; Edgware Road forms the eastern and Bayswater Road a part of the southern boundaries of Paddington. Paddington is not mentioned in *Domesday Book*, and was probably attached at that time to the manor of Tyburn. It was given by Edward VI to the see of London. Pop. (1921), 144,273.

Paddle-fish, or **Spoon-bill**, the *Polyŏdon folium*, a large fish allied to the sturgeons, so named from the elongated broad snout with which it stirs up the soft muddy bottom in search of food. It often reaches a length of from 5 to 6 feet. The paddle-fishes are exclusively North American in their distribution, being found in


180
165
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105
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45
30
ALASKA
YUKON
Klondike
MACKENZIE
NORTH WEST TERRITORIES
KEEWATIN
HUDSON BAY
Gulf of Alaska
Kodiak I.
Bristol Bay
Pribilof Is.
Aleutian Islands
Bering Sea
BRITISH COLUMBIA
ALBERTA
DOMINION OF CANADA
MANITOBA
NORTH AMERICA
QUEBEC
ONTARIO
Vancouver
Victoria
San Francisco
UNITED STATES
MEXICO
Gulf of Mexico
Midway I.
Tropic of Cancer
Yokohama to Victoria
Yokohama to San Francisco
Nome to Seattle
Sydney to Vancouver
Honolulu to San Francisco

the Mississippi, Ohio, and other great rivers of that continent.

Paddle-wheels, in steamships, the wheels (generally two in number, one placed on each side of the vessel) provided with boards, vanes, or floats on their circumferences, and driven by the engine for the ship's propulsion through the water. The vanes are usually of the 'feathering' type. This system of propulsion is an efficient one, but necessitates the use of very slow-running engines. Where rivers are very shallow or liable to obstruction by floating timber or growing vegetation, a single stern wheel of the paddle type is used for propulsion.

Pa'derborn, a town of Prussia, in the province of Westphalia. It is the see of a Roman Catholic bishop, and has a fine old cathedral, part of which dates from the eleventh century. The manufactures are unimportant, but there is a considerable trade. A Hanseatic town in the eleventh century, it became Prussian in 1859. Pop. 29,440.

Paderewski (pä-de-ref'skē), **Ignace Jan**, Polish pianist and composer, born in 1860. He could play the piano when he was three years old, and in 1872 went to Warsaw to study, soon afterwards touring through Russia, Siberia, and Roumania. In 1878 he became professor at the Warsaw Conservatoire, and in 1884 at the Strasbourg Conservatoire. He appeared in public at Vienna in 1887, subsequently in Paris in 1889, and in London in 1890, with universal admiration. His first visit to America took place in 1891. He composed a number of pieces for piano, orchestra, and voice, including an opera entitled *Mauru*. In 1899 he married the Baroness de Rosen. In 1919 he became Premier of the new Polish Republic, but resigned the premiership in December of the same year.

Pad'iham, a town and urban district of Lancashire, England, on the Calder; served by the Lancashire & Yorkshire Railway. St. Leonard's Church dates from the fifteenth (rebuilt nineteenth) century. The town is largely industrial, and is a centre of quarrying and coal-mining. Pop. (1921), 12,474.

Padilla (pȧ-*dēl'*yȧ), **Juan Lopez de**, a Spanish hero, born in 1484, died 24th April, 1521. In 1518 he became the leader in the insurrection of the Castilian towns (the so-called Communidades) against the arbitrary policy and Flemish advisers of Charles V. The fate of the insurrection was decided by the battle of Villalar, in which Padilla was wounded and taken prisoner. He was executed on the following day. His wife, Maria Pacheco, defended Toledo for some time after his death, and on its fall fled to Portugal. The names of Padilla and his wife are still household words among the Castilians.

Padina, a genus of Brown Algæ, family Dictyotaceæ. *P. Pavonia*, the peacock's tail, is one of the most beautiful of British sea-weeds. The fronds are fan- or sometimes cup-shaped, and marked with concentric rows of iridescent hairs, which give a characteristic mother-of-pearl-like appearance to the plant.

Padishah', a title of the Sultan of Turkey and of the Shah of Persia. The word is derived from *pad* (ruler or king), and *shah* (king, prince). The title may be literally interpreted as 'king of kings', cognate with Negus-negusti.

Pad'stow, an urban district, town, and seaport of Cornwall, England, on the estuary of the Camel; served by the London & South-Western Railway. It is a very ancient place, and furnished ships for the siege of Calais in 1346. Pop. (1921), 1737.

Padua, a province of Venetia, North Italy, on the Venetian Plain, traversed by the Bacchiglione, Adige, and Brenta. Wheat, wine, and rice are produced; sericulture is extensive. Area, 826 sq. miles; pop. 550,500.

Pad'ua (ancient **Patavium**; It. *Padŏva*), a city of Italy, capital of the province of the same name, on the Bacchiglione, which traverses it in several branches; served by, and a junction on the railway from Venice. Several streets are lined with mediæval arcades. The principal buildings are the Palazzo della Ragione (1172–1219); the church of S. Antonio of Padua (who was an associate of St. Francis of Assisi), founded in 1231, and restored in 1749; the cathedral (1550), with an adjoining baptistery adorned with frescoes of date 1380; and the university, which, founded in 1222, was one of the principal seats of learning in the Middle Ages. Many names famous in learning and art are connected with Padua, such as Galileo, Scaliger, Tasso, Giotto, Lippo Lippi, and Donatello. Pop. 105,000.

Padua traces its origin to Antenor, the mythical King of Troy, brother of Priam, and under Augustus was the wealthiest town of Upper Italy. All ancient monuments were destroyed by the barbarians on the decline and fall of the Roman Empire. The city was annexed to Venetia in 1405, and passed to Italy in 1866.

Paducah, a city of Kentucky, United States, the county seat of M'Cracken county, at the confluence of the Tennessee and Ohio Rivers. It is served by the Illinois Central Railway, and is the terminus of a branch of the Chattanooga & St. Louis Railway. Steamers run to Tennessee River ports. There is a trade in agricultural produce, implements, minerals, and tobacco, and there are large railway repair shops. Paducah was settled in 1821, and is named after a local Indian chief. It became a city in 1856. Pop. (1920), 24,738.

Pæan, in Greek, a hymn to Apollo or to other deities, or a song in praise of heroes. A pæan was sung, previous to battle, in honour of Ares (Mars), and after a victory, in praise of Apollo. The word is derived from Pæan, an ancient Greek god of healing, afterwards identified with Apollo. In the hymns to Apollo the phrase *Io pæan* was frequently repeated, and hence these hymns were also called *pæans.*

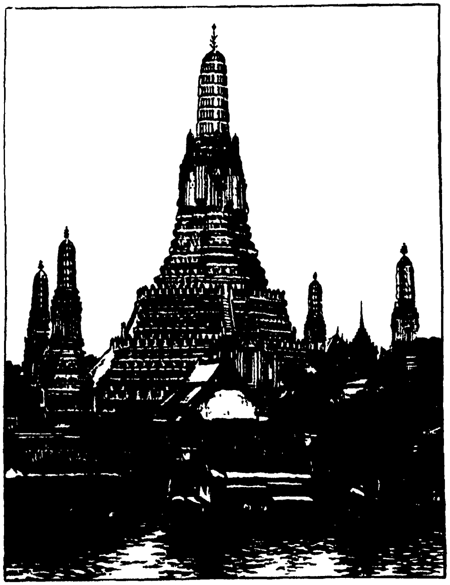
Pæstum (Gr. *Posidonia*), an ancient Greek city of Lower Italy, on the Gulf of Salerno. It is celebrated by the Latin poets for the fragrance of its twice-blowing roses, and its mild and balmy air. Little now remains of it but some fragments of its walls and the well-preserved ruins of two Doric temples of extreme interest, which were discovered in the middle of the eighteenth century. The city was settled by a Greek colony from Sybaris 524 B.C.

Paez (pá-eth'), José Antonio, one of the founders of South American independence, born of Indian parents near Acarigua, Venezuela, in 1790, died at New York in 1873. He entered the patriot army in 1810, rose to general of division in 1819, and took a leading part in the battle of Carabobo, which secured the independence of Colombia in 1821. At first he acted in concert with Bolivar, but in 1829 he placed himself at the head of the Revolution which culminated in the independence of Venezuela, of which he was the first President.

Pagan, a town of the Myingyan district of Upper Burmah, on the Irawadi. It was founded in A.D. 847 by King Pyinbya, and was capital until the fall of his dynasty in 1298. Pagan is full of decaying Buddhist temples and pagodas. Pop. (estimated), 70,000.

Pagani'ni, Niccolo, Italian violinist, born at Genoa 27th Oct., 1782, died at Nice 27th May, 1840. His father, who had some knowledge of music, and discerned the talents of his son, put him at a very early age under the best masters (Costa, Rolla, Paer) to learn music, and particularly the violin. With this instrument his progress was so rapid that at the age of nine he was able to perform in public at Genoa. His first engagement was in 1805, at Lucca, where he found a patroness in Princess Eliza, Bonaparte's sister. In 1813 he left Lucca for Milan, and in 1828 visited Vienna. From this period his fame was world-wide. The wonder which he excited was caused not merely by the charm of his execution and his extraordinary skill, but also by his external appearance, which had something weird and even demoniacal in it. After visiting almost all the great towns of Germany he made a musical tour through France and Great Britain, realizing immense gains. His last years were spent at a villa near Parma.—Cf. S. S. Stratton, *Niccolo Paganini: his Life and Work.*

Pagans, a term applied to the worshippers of many gods, the heathens, or to anyone who professes no religion whatever. The term is found for the first time in an edict of Valentinian (368), and is applied to the dwellers in villages (*pagani*). It appears that at that period polytheism had been abandoned, and Christianity became predominant in the towns, whilst the ancient polytheistic faith still continued to linger in the villages (*pagi*) and country districts. The *pagani* of the Latin races corresponded to the 'men of the heath' among the Teutonic races. Another explanation is that according to which *paganus* was originally employed in opposition to *milites*, professional soldiers. The Christians being considered as the soldiers of faith, all non-Christians were termed pagans. In the Middle Ages the name of pagans was given to all heathens and Mahommedans, i.e. all those who were neither Jews nor Christians, theirs being considered the only true religions. In modern times, however, Mahommedans, who worship the one Supreme God of the Jews and the Christians, are not called pagans. Paganism has never been really and thoroughly eradicated, in spite of the triumph of monotheism and Christianity. Numerous are the pagan practices which have gained entrance into the religions both of Christianity and Judaism.



Pagoda of Wat Cheng, Bangkok, Siam

Pago'da, a name given to a tower-like structure in the East (India, China, and Japan), connected with a temple or serving as a shrine.

The temple proper is generally of pyramidal form, and of a number of stories, of great size and height, and embellished with extraordinary splendour. Connected with it may be various other structures, open courts, &c., the whole forming architecturally a very imposing group. Pagodas are numerous not only in Hindustan but also in Burmah, Siam, and China. The statues in the temples, which are also called *pagodas*, are often of a colossal size.

Pahang′, the largest of the Federated Malay States, on the east coast of British Malaya. In the east it is mountainous, but towards the coast it is low and swampy. The principal river is the Pahang, to the drainage basin of which, with its tributaries, the state exclusively belongs Rubber, timber, tin and other minerals, coconuts, and copra are produced. The eastern railway system runs to Kuala Lipis. Area, 14,000 sq. miles; pop. (1911), 118,708.

Pekan is the seat of the Sultan; Kuala Lipis is the administrative centre, and is connected by motor-road with Kuala Kubu, in Selangor. Pahang voluntarily surrendered the control of foreign affairs to a British Resident in 1887, and the Raja (now Sultan) agreed to a British Protectorate in 1888. See *Malaya.*

Paignton, an urban district and seaside-resort of Devonshire, England, on Tor Bay; served by the Great Western Railway. It contains the ruined palace of the Bishops of Exeter, and a Bible Tower, where Miles Coverdale resided while translating the Bible. There is a pleasure-pier. Pop. (1921), 14,443.

Pain is the result of the violent stimulation of sensory nerves and is of biological importance in warning the individual that all is not well. The degree of pain, however, is rarely in direct proportion to the gravity of a disease, and is often altogether absent when there are other symptoms of a serious malady.

Paine, Thomas, political and deistical writer, born in 1737 at Thetford, in Norfolk, died at New York in 1809. The son of a stay-maker, he tried many ways of making a living in his earlier years, and in 1774 emigrated to America, with a letter of introduction from Benjamin Franklin. Paine threw himself heart and soul into the cause of the colonists, and his pamphlet entitled *Common Sense*, written to recommend the separation of the colonies from Great Britain, and his subsequent periodical called *The Crisis*, gave him a title to be considered one of the founders of American independence. In 1787 he returned to England, and in answer to Burke's *Reflections on the French Revolution* wrote his *Rights of Man.* A prosecution was commenced against him as the author of that work, but while the trial was pending he escaped to France, where he was chosen member of the National Convention for the department of Calais. On the trial of Louis XVI he voted against the sentence of death, proposing his imprisonment during the war and his banishment afterwards. This conduct offended the Jacobins, and towards the close of 1793 he was excluded from the Convention, arrested, and committed to prison, where he lay for ten months, escaping the guillotine by an accident. Just before his confinement he had finished the first part of his work against revelation, entitled *The Age of Reason*, which was published in London and Paris in 1794. He remained in France till Aug., 1802, when he returned to America.

Painesville, a city of Ohio, United States, the county seat of Lake county, on Grand River; served by the Lake Shore & Michigan Southern, the Baltimore & Ohio, and the New York, Chicago, & St. Louis Railways, and by electric-traction lines. It is the seat of Lake Erie College (for women), and is a farming and horticultural centre. Founded in 1800, it became a city in 1902. Pop. 8000.

Painting, the representation of objects by the application of colour to a surface, is among the oldest of the arts, though the number of early examples which survive is small. Important among these are the vigorous and realistic palæolithic paintings of animals on the walls of the cave of Altamira in Spain, executed in black, red, and yellow. In Ancient Egypt a wide range of colour was used, including a famous blue made from copper, with a medium of gum or glue, for the decoration of walls, coffins, and papyrus manuscripts. Similar methods were employed in Mesopotamia; and in Crete (*c.* 2000–1500 B.C.) true fresco painting (see *Fresco*) was also widely used, of which fine examples exist at Knossos. In all this painting, the emphasis is on profile and contour, and there is no serious attempt to express solid form or space; though certain Cretan examples foreshadow later developments by suggesting landscape or architectural backgrounds, and by representing figures in crowds. Of the mural paintings and panel pictures produced in large numbers in Greece, very few authentic examples survive; but the vase paintings and literary sources indicate their character. In the sixth century B.C. there is a transition from simple outline to the use of inner markings to express form; and in the fifth century foreshortening is attempted, and space is expressed by placing figures on different levels, and the use of rudimentary landscape backgrounds. In the fourth century, Greek painting, as represented by Apelles, Zeuxis, and Protogenes, reached its highest development, in which foreshortening difficulties were overcome, but problems of space only inadequately solved. This appears from the wall paintings of Pompeii, the majority of which are copies of Greek pictures, though a few may be originals. The Romans were content to repeat Greek motives, and use Greek methods. In both countries a range of colour was employed almost as wide as in modern painting. On panels, the medium was wax (see *Encaustic Painting*) and another of unknown composition; for wall decoration, the Romans used a species of true fresco extensively, as well as the tempera methods (see *Distemper*) preferred by the Greeks. After the barbarian invasions and the disruption of the Roman Empire, painting found its chief home in Byzantium (Constantinople), whose artists employed the classic methods of fresco and tempera in an art mingling Hellenic and Eastern elements, and marked by conventional, non-realistic treatment of the figure and by rich decorative quality. More important, however, were the Byzantine mosaics (see *Mosaic*), which mainly contributed to the revival of painting in Italy in the thirteenth century. Of this, Siena was among the most important centres; and here developed an art Byzantine in type, but with a lyrical quality of linear design of its own. Duccio, followed by Pietro and Ambrogio Lorenzetti, and Simone Martine were the leaders of the school, whose influence, however, steadily waned before that of the Florentines. Among these, the first great figure was Giotto, whose feeling for solid sculpturesque form and monumental design, combined with power of individual characterization and a sense of drama, make him one of the most potent influences in Italian art. After his death, however, Florence for a time was dominated by the decorative linear painters such as Lorenzo Monaco, until the rise of Masaccio. The famous fourteenth-century treatise of painting by Cennino Cennini tells us that these early painters mainly used egg-tempera as their medium on panels, and either this or true fresco on walls, developing the method, which subsequently became universal, of covering with a layer of thin new plaster the portion of the wall to be painted each day. With Masaccio begins the great age of Italian painting. He was the first satisfactorily to express space, and to use light and shade to give both unity and greater plastic quality. Later fifteenth-century painters hardly rivalled his achievement in these respects; but the restless spirit of scientific inquiry which marked Florentine art is exemplified by the researches of Paolo Uccello into perspective, and by a severe realism which is combined in Fra Filippo Lippi and Botticelli with a lyric decorative quality, in Fra Angelico with a tender mysticism, and in Pollaiulo and Andrea del Castagno with a passionate austerity. Florentine influence soon dominated Siena; bred in North Italy (mainly through the work in Padua of the sculptor Donatello) a great school of which Andrea Mantegna is the chief figure; and extended even to Venice. Meanwhile in the fifteenth century an important school of painting had developed in Flanders, in which the brothers Hubert and John Van Eyck and Roger Van der Weyden were prominent, whose work is marked by intense realism, fine colour, and great technical skill. Its influence was felt in France, Spain, Germany, and extended to Italy, where the Flemish method of painting (in which transparent coloured varnishes were used over a tempera ground on which the picture had previously been painted in monochrome) led to the development of modern methods of oil painting, which put into artists' hands a medium of unrivalled range and flexibility. The earlier masters first *laid in* their work in monochrome, with full light and shade, and then applied colour by means of *glazes* (thin coats of transparent paint) and *scumbles* (thin and therefore semi-transparent coats of opaque paint). These methods persisted until the nineteenth century; but in the seventeenth the direct painting characteristic of modern work appears. At the end of the fifteenth and the beginning of the sixteenth century Italian painting reached its culminating point in the art of the High Renaissance. Leonardo da Vinci and Michelangelo achieved unrivalled grandeur in design, richness of chiaroscuro, and plastic quality; while Raphael adds a Florentine sense of form to an Umbrian feeling for space, derived largely from his master Perugino. This period also saw the rise of the Venetian school, which was so profoundly to influence seventeenth and eighteenth century art. Developed in a society of which wealth, stability, and material splendour were the characteristics, the art of Giovanni Bellini and his followers struck a note of delight in external display and rich opulent colour, to which Giorgione and the young Titian join the spirit of pagan poesy which underlies the Renaissance in Venice. Titian in his later years, however, and Tintoretto reflect the disillusionment expressed by the Counter-Reformation, and show a rejection of the older use of definite form and positive colour in favour of atmospheric envelopment and strong contrasts of light and shade. A temporary challenge to Italian supremacy in the sixteenth century came from Germany in the art of Holbein and Dürer; but in the seventeenth century the centre of gravity in painting definitely passed to Northern Europe. The traditions of the High Renaissance were, however, in some measure maintained in the mannered and skilful art of the Bolognese and Roman eclectics, while a realistic revival of widespread influence centred round the personality of Caravaggio; and in the eighteenth century there arose an important group of topographical painters such as Canaletto and Guardi, and of decorative painters such as Tiepolo, whose work and influence were of real importance. Outside Italy, the genius of Rubens once more brought the school of Flanders into prominence, after a period of eclipse. He combined the qualities of his Flemish predecessors with designs inspired by the Venetians, into an art unrivalled in its expression of dynamic energy; and his pupil Vandyck, still more strongly influenced by Italy, developed a style in portraiture of singular dignity and refinement, if sometimes mannered and sentimental, which was to become an abiding force in English art. In the seventeenth century also developed the Dutch School, in its realism, colour, and craftsmanship akin to the Flemish, but with distinct character due to the tastes of the wealthy burghers who dominated society in Holland. Their demands helped the rise of the Dutch portrait painters, represented by the brilliant though superficial Frans Hals; of the genre painters, such as Vermeer and De Hooch; of the still-life painters; and of the landscape painters such as Hobbema, Cuyp, and Ruisdael, who prepared the way for the English landscape school. Supreme above all his contemporaries in his insight into character and his imaginative power was Rembrandt, who developed a powerful and individual use of chiaroscuro, based on the introduction of light into luminous darkness to emphasize and reveal the forms it shrouded. Contemporary Spanish painters found the realistic tendencies of the age and the use of strong light and shade well suited to their temperament. El Greco, a Cretan trained in Venice, stands by himself in his use of colour and bold distortion of form as a means of emotional expression; but he paves the way for the dramatic, sombre, and realistic art of Ribera and Zurburan. In the developed art of Velasquez, however, realism is united to dignity and reticence, and light and shade are used to obtain a series of silhouettes from which a linear design is woven. This in some measure anticipates the work of Manet and his followers, and with other qualities makes Velasquez one of the fathers of modern painting. Murillo's considerable talent was obscured by sentimentality, and an unhappy compromise between the use of light and shade and of positive colour. He is the last great personality in Spanish painting, save for the isolated figure of Goya, whose savagely satiric and technically accomplished art of the late eighteenth and early nineteenth century powerfully influenced French painting. But the real successor to the artistic supremacy of Italy was France. In the sixteenth century a group of realistic portrait painters, typified by Jean Clouet and his son François, and a group of decorative painters, represent respectively the naturalistic instinct and the passion for close-knit logical design which in combination have produced the finest and most characteristic French art. In the seventeenth century appear the powerful and dignified art of Nicolas Poussin, which is a living force in landscape and figure painting; the poetic landscapes of Claude Lorrain, full of golden light; the sincere and well-characterized portraits by Philippe de Champaigne; and the realistic peasant groups of the brothers Le Nain. There follows the group of portrait painters and decorators, headed by Charles Le Brun, whose chief employment centred round the personality and palaces of Louis XIV, and produced an art characteristic of the age in its pompous and somewhat empty splendour. Similarly, eighteenth-century tastes and manners are reflected in the painters of *fêtes galantes*, among whom Watteau showed incomparable imaginative power and beauty of handling; in the decorative paintings of Boucher, and the exquisitely delicate work of his greater pupil Fragonard; in the sentimental genre work of Greuze and others; and in the sincere and accomplished still-life and genre of Chardin. With the Revolution and the rise of the neo-classic movement, of which David is the central figure, this gay, sensuous, and often whimsical and fantastic art was succeeded by one to which sombre colour, sculpturesque form, and severe design gave its character. Meanwhile in England, where great artistic activity in the Middle Ages had been followed by two centuries of domination by foreign artists, there came in the eighteenth century a revival of a native art in which Hogarth plays a great part. His fondness for anecdote, his realism pushed to the point of caricature, and his use of rich colour are characteristic of English painting. Best known by his genre work, he is also an important member of the group of portrait painters headed by Reynolds, Romney, and Gainsborough, the rise of which was assisted so much by the sense of individual importance which marked life in eighteenth-century England. At the same time the topographical painters prepared the way for the landscape school, wherein Gainsborough, Wilson, and John Crome are the chief personalities, followed by Constable and Turner. Constable's naturalism and handling of colour deeply influenced the French Romantics, while from Turner the Impressionists learnt their chief lessons. Otherwise, the history of nineteenth-century painting centres round France, where a bewildering succession of personalities and movements appear, only to be compared to those seen in Italy from 1430 to 1530. The tradition of neo-classicism was vigorously maintained in the work of Ingres, an incomparable draughtsman; but its supremacy was challenged by the Romantics, headed by Delacroix, who stood for a passionate subjective art in which colour played a great part. A similar outlook appears in the landscapes of the Barbizon school, led by Corot and Rousseau; and their devotion to the French countryside has a counterpart in the poetic art of Millet, wherein the French peasant is the main theme. A tendency towards mannerisms and academic coldness in the middle of the century was checked by the rise of the Realists, prominent among whom was Courbet, and of the two types of impressionism (q.v.) represented respectively by Manet's early work, and by Claude Monet. To-day, the doctrines and practice of the impressionists largely inspire painting in all Western countries; but recently a movement in revolt has developed in which Cézanne is the leading figure (see *Post-Impressionism*).—BIBLIOGRAPHY: A. P. Laurie, *Materials of the Painter's Craft*; A. H. Church, *The Chemistry of Paints and Painting*; G. Moreau-Vautier, *The Technique of Painting*; C. J. Holmes, *The Science of Picture Making*; A. Michel, *Histoire de l'Art*; Woltman and Woermann, *History of Painting*; R. Muther, *History of Modern Painting*; J. A. Crowe and G. B. Cavalcaselle, *History of Painting in Italy*; D. S. MacColl, *Painting in the 19th Century*.

Paints and Pigments. Paints and pigments are closely related to one another, the latter being the dry coloured powders which form the bases of the paints.

Paints.—The various constituents of an oil paint are known as the *base*, the *vehicle*, the *solvent*, and the *driers*. As an example, the base may consist of a pigment such as white lead, red lead, oxide of iron, &c., which is mixed into a thin paste with linseed oil (the vehicle) and turpentine (the solvent or 'thinner'). 'Driers' such as litharge, sulphate of zinc, or borate of manganese may be added to hasten the drying and hardening of the paint. The linseed oil is usually rendered siccative by heating it with driers before mixing it with the other ingredients of the paint, causing it to absorb oxygen from the air more readily and form a tough elastic coating round the particles of pigment. The turpentine, which soon evaporates, enables the paint to be spread in a thin even coat. In place of linseed oil other drying oils such as hemp, poppy seed, and nut oils are sometimes employed in the cheaper kinds of paints; whilst petroleum is also used in place of turpentine.

For *enamel paints* the vehicle consists of a varnish composed of resin dissolved in turpentine and methylated spirit, the desired colour being obtained by the incorporation of suitable pigments.

Artists' oil colours are very similar to ordinary paints, but more care is bestowed on their preparation, especially in the choice of pigments, which must be unaffected by atmospheric influences and light. The pigment is made into a paste with the oil or oil varnish mixture, and then put through a mill furnished with granite rollers, after which it is squeezed into tubes ready for use.

Water colours differ in principle from oil and enamel colours in that the vehicle consists of a solution of gum arabic, dextrine, or isinglass, &c. These paints are sold either in dry cakes, which are rubbed down with water for use, or as a paste which also needs thinning with water. The pigments employed in the preparation of water colours are as a rule similar to those used in oil paints.

Casein colours are made by incorporating a pigment with a mixture of casein and powdered quicklime, water being added until a thick paste is obtained which is then finally ground in a mill and packed in sealed cans. These colours are much used for distempering walls, and have the advantage of being washable. Various paints, such as those possessing damp-proof, fire-proof, anti-fouling, or luminous properties are used for special purposes.

Pigments.—Pigments are the coloured substances which are mixed with suitable vehicles to form paints. They differ from dyes in being insoluble. They should be unaffected by air, water, and sunlight, or by gases with which they come in contact. Pigments are chiefly of mineral origin and may consist of the oxide, carbonate, silicate, sulphate, chromate, &c., of various metals such as lead, zinc, mercury, cadmium, iron, chromium, and barium. Other pigments of animal or vegetable origin are also used, but to a less extent, as they are usually somewhat fugitive.

In the case of paints and artists' colours compounded with linseed oil, a certain amount of reaction takes place between the pigment and the vehicle. Linseed oil consists of the glyceryl esters of various fatty acids which react chemically with metallic compounds to form salts which may be regarded as metallic soaps. Oxides of iron and of chromium form compounds of this nature which dry readily on exposure to air. The lead soaps dry more slowly with the formation of a somewhat elastic compound, whilst those formed from zinc are hard and brittle.

Chemical Composition of Pigments: *Elementary Substances.*—These consist chiefly of finely-powdered metals such as gold, aluminium, silver, and platinum, which are used when a metallic effect is required. Carbon is the chief constituent of black pigments such as ivory, lamp, and charcoal blacks, graphite (black lead), and Indian ink. The purest form of black pigment, known as carbon black, is permanent, and of great intensity and covering power. It is largely manufactured by the incomplete combustion of the gases naturally occurring in Alberta and elsewhere.

Oxides.—Zinc white, chromium green, red lead, cobalt black, manganese brown, and antimony white are all oxides of their respective metals. Iron oxide is the main constituent of the ochres, burnt sienna, Venetian red, and Indian red. Many pigments consist of mixtures of the oxides of various metals such as burnt umber (iron and manganese), cobalt blue (cobalt and aluminium), and cobalt green (cobalt and zinc). Prussian brown is an oxide of iron prepared by heating Prussian blue to a red heat; it is of a nut-brown colour, and is perfectly permanent. Many of these pigments, especially the ochres (q.v.) and siennas are found in the natural state; they are prepared for use by grinding and washing. Red lead is formed when litharge or white lead is heated to a gentle red heat in the presence of air. It is much used as a pigment for decorative work, but is not suitable for use in artists' colours. Zinc white is prepared by heating metallic zinc to its boiling-point and mixing the vapour with a large supply of air, when oxidation takes place.

Carbonates.—White lead consists of a basic lead carbonate, and is manufactured by the action of carbonic acid gas (CO_2) on basic acetate of lead, which is formed by treating the metal with vinegar (acetic acid). As a source of CO_2, fermenting dung or waste furnace gases are used. White lead forms the basis of many white or light-coloured paints used for decorative purposes. It possesses good covering power, but darkens in the air (owing to the presence of sulphuretted hydrogen), and is poisonous. Calcium carbonate (chalk or whitening) is used as an adulterant in common pigments, but is of little use for paint-making.

Sulphides.—Vermilion is a sulphide of mercury (HgS) which is found native, but is also prepared from its elements by fusion and sublimation. Cadmium yellow consists of the sulphide, likewise antimony red. King's yellow and realgar or red orpiment are sulphides of arsenic, which are found native and also prepared artificially. They are both poisonous, but notwithstanding this the former is used in oil painting. Griffith's zinc white (lithopone) is an oxysulphide which has largely replaced white lead, on account of its greater permanence.

Sulphates. — Permanent white or blanc fixe consists of artificially prepared barium sulphate ($BaSO_4$); it is perfectly permanent, has good covering powers, and has largely replaced white lead. Freeman's white lead contains a large proportion of lead sulphate, and is less objectionable than ordinary white lead as a pigment.

Chromates.—Chrome yellow is lead chromate ($PbCrO_4$), obtained by the action of sodium chromate on a solution of a lead salt, preferably the acetate (sugar of lead). Chrome red is the basic chromate prepared in a similar manner from the basic acetate, or by treating chrome yellow with an alkaline solution. Chrome orange is a mixture of the above-mentioned pigments. Lemon chrome consists of barium chromate and is a very stable colour; zinc and strontium chromates are also used as yellow pigments.

Silicates.—Terre-verte, a natural green ochreous earth, consists of iron, magnesium, and potassium silicates, and is fairly permanent. Smalt (royal blue or Saxon blue) is a silicate of potash and cobalt, made by fusing their respective oxides with sand. Ultramarine blue is prepared by fusing together clay and sulphur with soda and finally grinding the product; it is fairly permanent except in the presence of acids.

Miscellaneous Compounds.—Brunswick green is an oxychloride of copper. Scheele's green is a copper arsenite, whilst Schweinfurt green is a basic form of the same compound. Both these pigments are exceedingly poisonous, and their use should be prohibited. Nürnberg violet consists of manganese metaphosphate. Prussian blue is composed of ferric ferrocyanide (see *Cyanides*). Cobalt yellow or aureolin is potassium cobaltinitrite. Naples yellow consists of lead antimonate; it is not permanent.

Animal and Vegetable Pigments. — Sepia, a dark-brown colouring matter obtained from the ink-sac of the cuttle-fish, is a permanent pigment much used for water colours, but not suited for oil colours. Cochineal lakes are made in various shades of crimson, purple, and carmine, but the colours fade in sunlight and in contact with oxidizing bodies. Yellow lakes are made by precipitating an extract of Persian berries with alumina; the colours are fugitive. Indigo blue, gamboge, and the red madder lakes are more permanent. Asphaltum, or mineral pitch, possesses a dark-brown colour, but is sensitive to light and should never be used for oil painting. The various lakes prepared from aniline dyes are not very permanent, but are, nevertheless, used for certain purposes.

General Remarks on the Choice of Pigments.—In the compounding of a paint it is of great importance to choose pigments which do not react chemically with one another, or with the vehicle, in such a way as to produce alteration of the colour on exposure to air or light. All compounds of lead, copper, and silver readily combine with sulphuretted hydrogen, which is present in air, especially near towns, with the formation of a black sulphide. For this reason alone such pigments should be avoided in all artists' colours or other paints where permanence is required.

Further, if such pigments are mixed with others containing sulphides, a similar reaction will take place, although this may be retarded to a certain extent by using a vehicle of a resinous or varnish-like nature. Other pigments possessing oxidizing properties, such as chromates, tend to become green by the formation of chromium green. They also have an oxidizing action on sulphides and pigments of an animal or vegetable origin; but this is also less marked when a resinous vehicle is used. Other influences also tend to destroy the colour of a pigment, such as strong sunlight and air, especially in the presence of moisture. In this respect pigments of an animal or vegetable nature are as a rule inferior to those of mineral origin. For artists' colours the pigments which should be avoided, above all others, are lead compounds, especially red and white lead; also chromates, asphaltum, and animal and vegetable pigments of a fugitive nature.

The *adulteration* of paints and pigments is often practised, but is not always easy to detect. Carbon black is sometimes found to be ivory black mixed with indigo. Antimony red is adulterated with red lead; white lead or zinc white are found mixed with china clay or whitening. These adulterations can only be detected by chemical tests after removal of the vehicle by means of a solvent, and recovery of the pigments in the dry powder form.

Fuller information on many of the pigments mentioned above is given in separate articles.

BIBLIOGRAPHY: J. N. Friend, *Introduction to the Chemistry of Paints*; A. P. Laurie, *Facts about Processes, Pigments, and Vehicles* (for art students); G. Zerr and R. Rubencamp, *Treatise on Colour Manufacture*.

Paisiello (pá-i-si-el'lō), Giovanni, Italian composer, born at Taranto 9th May, 1741, died at Naples 5th June, 1816. His first opera, *La Pupilla*, was performed at Bologna in 1763. From this period commenced a long career of success, which attended him at Modena, Parma, Venice, Rome, Milan, Naples, and Florence. In 1776 he was induced to enter the service of Catherine II of Russia, as musical tutor to the grand-duchess. Here during eight years' residence he composed his best productions, *La Serva Padrona* and *Il Barbiere di Seviglia*. He then visited Vienna, where he composed *Il Rè Teodoro*, another of his best operas, and twelve symphonies for the Emperor Joseph II. He returned to Naples in 1785, and, with the exception of three years spent in Paris, he remained there the rest of his life.

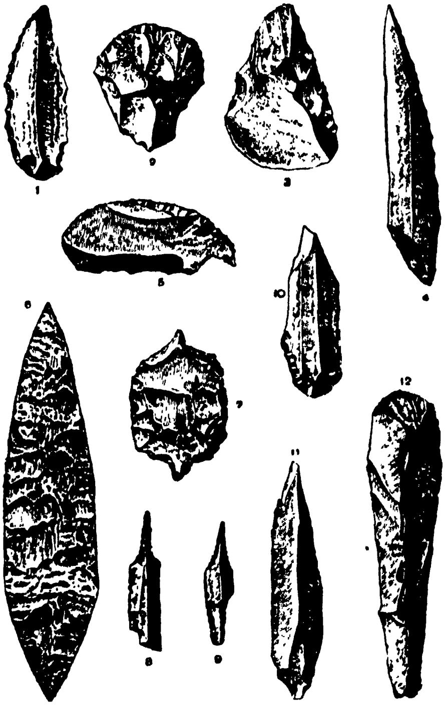
Paisley (ancient **Vanduara**), a municipal burgh and manufacturing town of Scotland, in the county of Renfrew. It stands on the White Cart, near its confluence with the Clyde, and is served by the Caledonian and the Glasgow & South-Western Railways. It consists of an old town on the west or left, and a new town on the east or right bank of the river, communicating by three handsome bridges. The Abbey Church, belonging to a Cluniac monastery founded in 1163 by Walter, son of Alan, High Steward of Scotland, the first of the Royal House of Stewart, was dedicated to (among others) St. Mirren (Mirinu), the patron saint of Paisley, and to St. Milburgha of Much Wenlock (Shropshire), the home of the original monks. Since 1860 the main body of the church, consisting of a nave and two aisles, the latter separated from the nave by five massive clustered columns on each side, has been the parish church. In 1889 a monument was erected by Queen Victoria over the burial-place of Robert III. In St. Mirren's Chapel or the Sounding Aisle, on the south side, stands a tomb supposed to have been built in honour of Bruce's daughter Marjory. An imposing modern Baptist church, the Coats Memorial, is one of the finest church edifices in Scotland, and was erected by the Coats family. Nearby is Crookston Castle, a twelfth-century structure, which was a possession of the Stewart family until 1567, and eventually passed to the family of Montrose. It now belongs to the Maxwells of Pollok. Paisley has been long noted for its manufactures, especially of textile goods. The shawl manufacture, introduced about the beginning of the nineteenth century, and long a flourishing industry, is not now a staple, but the textile manufacture is still large, though the chief industry is that of cotton thread, for which Paisley is celebrated throughout the world. The factories of the firm of Coats are within the town. Among the other manufactures are tapestry, embroidery, tartans, and carpets. There are also dye- and print-works, engineering-works, soap-works, manufactories of starch, corn-flour, mustard, and chemicals; distilleries, breweries, and shipbuilding yards, chiefly for river steamers. The River Cart was widened and deepened in 1894, and a harbour was constructed. Wilson the ornithologist, the poet Tannahill, and Professor Wilson (Christopher North) were natives of Paisley.

Paisley was the site of *Vanduara*, a Roman fort built on Oakshaw Hill about A.D. 84. As Passeleth the town is mentioned in 1157, and was granted to Walter, son of Alan (i.e. Fitzalan), who built the Abbey around which the town gradually extended. It became a barony in 1488, and as such returned a member to the Scots Parliament. Pop. (1921), 84,837.

Pal'adin, a term originally applied to the *Comes palatii*, Count of the Palace, or Count Palatine, the official who superintended the household of the Carlovingian sovereigns, and then to the companions in arms of Charlemagne, who belonged to his court. In the romances of chivalry the word was applied to the semi-fabulous companions of Charlemagne and to the Knights of the Round Table. The word was afterwards used by the romantic poets of Italy for a knight-errant generally.

Palæarctic Region, in zoology, one of six divisions of the world based upon their characteristic faunæ. It embraces Europe, Asia (except South Arabia and the area south of the Himálaya and their continuations), and Africa north of the Tropic of Cancer.

Palæolithic Age. Lord Avebury (when Sir John Lubbock) divided the 'Stone Age' of archæology into two parts, (1) the Palæolithic or 'Old Stone' Age, and (2) the Neolithic or 'New Stone' Age. The former term was applied to the older roughly chipped flint implements, and the latter to implements of polished flint or stone, and to all other flint and stone implements after polishing came into fashion. Recent research work and discoveries have, however, made it necessary to divide and subdivide Palæolithic. 'Lower Palæolithic' now refers to the implements of Neanderthal man (q.v.) and pre-Neanderthal man and their industries, and 'Upper Palæolithic' to the implements of Cro-Magnon man and his successors, who worked flint, stone, horn, bone, and wood. 'Lower Palæolithic' includes the culture-stages (1) pre-Chellean, (2) Chellean, (3) Acheulian, and (4) Mousterian. 'Upper Palæolithic' includes the culture-stages (1) Aurignacian, (2) Solutrean, and (3) Magdalenian. The stages of transition between Palæolithic and Neolithic are (1) Azilian, (2) Tardenoisian, and (3) Maglemosian. It has been found that 'Palæolithic' applies to the longest period in human history. Scientists differ as to the precise geological horizons of the various stages of culture. Penck and J. Geikie have placed Chellean and Acheulian in the Second Interglacial epoch, Mousterian in the Third Glacial and Third Interglacial epochs, Aurignacian in late Third Interglacial and early Fourth Glacial, and Magdalenian in early post-Glacial. Boule, Breuil, Obermaier, Schmidt, &c., have, however, placed pre-Chellean, Chellean, Acheulian, and Early Mousterian in the Third Interglacial epoch, and Aurignacian, Solutrean and Magdalenian in the post-Glacial epoch. This arrangement leaves no gap between Upper Palæolithic and the Azilian, &c., stages of transition, and is the one most widely favoured. The Mousterian industry, the final in Lower Palæolithic, is that of Neanderthal man, pre-Chellean, Chellean, and Acheulian being the stages of the pre-Neanderthal peoples. Modern man (*homo sapiens*), represented by the Cro-Magnon races in Western Europe, inaugurated the Upper Palæolithic culture-stages, beginning with Aurignacian. The new culture and new peoples came from North Africa over the Italian land-bridge. The Aurignacian (Cro-Magnon) people buried their dead with ceremony, as in the Grimaldi caves near Mentone, smearing the bodies with red earth, adorning them with shell and other amulets, and sometimes placing small green stones between their teeth. A Red Sea shell has been found associated with one Grimaldi burial. The Cro-Magnon peoples were hunters and cave-dwellers, and decorated caves with realistic representations of animals, and with female figures usually referred to as 'Venuses'. A typical Aurignacian burial is that of the 'Red Man' (*not* 'Red Lady') of Paviland cave, Gower Peninsula, South Wales. The Solutrean industry was introduced at a later period from Eastern Europe, and swept westward to Northern Spain, but never influenced Italy, Southern Spain, or Britain. It was preceded by



Upper Palæolithic Implements

1, Aurignacian (Chatelperron point). 2, 3, Aurignacian (keeled scrapers). 4, Aurignacian point. 5, Magdalenian ('parrot-beak' graving-tool). 6, Solutrean ('laurel-leaf' point). 7, Solutrean (drill or borer). 8, 9, Solutrean (awl and 'shouldered' point). 10, 11, 12, Magdalenian (industrial and art implements).

a proto-Solutrean influence that entered Italy from North Africa and reached England. During the Solutrean epoch the climate of Central and Western Europe was milder than when the Aurignacian was first introduced, but cold and dry. Open-air camps beside rock-shelters were favoured. Then came, with a lowering of the temperature, the Magdalenian epoch, which owed nothing to Solutrean culture.

During the Solutrean epoch flint was beautifully worked, the laurel-leaf lance-heads being of outstanding merit. No subsequent flint-working surpassed Solutrean in finish. The Magdalenian artifacts were mainly of horn (reindeer) and bone. Flint was not greatly used or well worked, except for engraving; the Aurignacian methods were revived. If the Solutrean peoples were intruders, the Magdalenian peoples were mainly of the older Cro-Magnon stock, but new types were arriving in Europe, including proto-Iberians, some broad-heads, and a proto-Eskimo type. The cave art of the Magdalenian stage reached a high standard of excellence, so high, indeed, that it is comparable with modern art. Animals were engraved and painted in caves, probably for magico-religious purposes. The art of sculpture in low relief was practised, while bone and ivory were finely carved, occasionally ‘ in the round ’. Female human figures were favoured as in Aurignacian times. The Solutrean figures were mainly male. Magdalenian culture reached Britain, and its influence has been traced by the Abbé Breuil as far north as Argyllshire. Aurignacian, Solutrean, and Magdalenian are included in the ‘ Reindeer Age ’. As the climate grew milder the reindeer migrated northward, and the red deer arrived, inaugurating a ‘ Red Deer Age ’, during the early part of which Magdalenian civilization was broken up, and the cave art ceased. Following the red deer, the wild cow, boar, and other animals came the Azilian peoples. They imitated Magdalenian reindeer-horn harpoons in red deer horn, and introduced bows and arrows. On cliff-shelters in Eastern Spain they painted and engraved scenes of daily life and the chase. Like the Magdalenians, the females wore skirts and head-dresses, necklaces, armlets, and anklets. Sometimes women hunted like the men. Great animal drives were favoured. The art became conventionalized until animals and hunters were represented by symbols and alphabetical signs. The Azilians met and mingled with a people who entered Europe through Italy, where the Aurignacian culture still prevailed. Tardenoisian implements included microliths (pygmy flints), which were apparently used for fishing. The Azilian-Tardenoisian culture entered Britain and reached Scotland, a typical station being the MacArthur cave, Oban. Meanwhile an intruding people from Siberia passed down both sides of the Baltic. They were probably the ancestors of the fair Northern race. Their culture is called Maglemosian. It shows Magdalenian influence, but the harpoons were mainly one-sided, and chiefly of bone. Maglemosian artifacts have been found in North-East England, and Maglemosian influence has been traced in Scotland. The Maglemosians may have crossed to Britain by the North Sea land-bridge, especially when the rivers were frozen. Before the Neolithic industry was introduced in Northern Europe, the English Channel and North Sea land-bridges were severed. See *Neolithic*.

PALÆOLITHIC

Interglacial. Lower Palæolithic..	(1) Pre-Chellean	Pre-Neanderthal and Neanderthal races. (Warm and cold epochs and fauna.)
	(2) Chellean	
	(3) Acheulian	
	(4) Mousterian	
Post-Glacial. Upper Palæolithic..	(1) Aurignacian	Reindeer Age (Cro-Magnon and other races.)
	(2) Solutrean	
	(3) Magdalenian	
Transition from Palæolithic to Neolithic	(1) Azilian	Early Red Deer Age. (Iberian, Northern, and other races.)
	(2) Tardenoisian	
	(3) Maglemosian	

Palæontol′ogy (Gr. *palaios*, ancient, *onta*, beings), the scientific study and description of fossil organic remains, that is, of the relics of plants and animals that preceded those prevalent at the present day. In the articles on *Fossils* and *Geology* some idea has been given of the various modes of preservation of these remains, and of their philosophic interest as a basis for the reconstruction of the history of life upon the globe. The palæontologist, though he relies very largely on the researches of the zoologist and the botanist, utilizes their results to form pictures of successive faunas and floras, whether he deals with limited areas like the British Isles, or surveys, from period to period, the progress of life in contemporaneous continents and seas. The imperfections of the material with which he deals necessitate some knowledge of the possibilities of mineral change. The more he appreciates the physical characters of strata in the field, the more sure will be his reading of earth-history. If he has been so fortunate as to preside in the open country at the extraction of the fossils with which he deals, he will experience all the joy of the archæologist who breaks for the first time into the frescoed chambers of a tomb. The true zoologist or botanist has seen his subjects as they lived; the true palæontologist has at any rate seen them as they died. The excavation of a slab of Old Red Sandstone, with its fishes caught in some shallow of a shrinking estuary, or overwhelmed by a sudden run of sand, gives a vivid meaning to the details of fins and scales that are worked out later in the cabinets of museums. In a block of clay, the age of which must be measured in millions of years, molluscan shells may lie heaped together as on the floor of a modern sea, and the mass brings the requisite touch of natural history into the description of characters by which species are defined.

Palæontology is essentially a progressive science. Fossils must often be named in the first instance from very imperfect material, and subsequent discoveries may furnish warning corrections or welcome confirmations of conjecture. The elongation of a finger in the pterosaurs showed that these reptiles were endowed with powers of flight; but now the impression of the wings of Rhamphorhynchus are known from the fine-grained limestone of Eichstätt, in Bavaria. The downward bend of the termination of the vertebral column in the well-known marine reptile Ichthyosaurus was long ascribed to fracture; but slabs from Württemberg have revealed to us that the column was continued as the support of the lower half of a bilobed tail.

In some cases new discoveries have led to the transfer of a genus from one order, or even from one class, to another. In fossil botany, particularly, the assignment of a specimen in the first instance is often fraught with doubt, since much depends on the mode of reproduction of the plant, or on the structure of a stem that has been flattened down to a mere carbonaceous film. Whole groups of soft-bodied animals may have left mere tracks and burrows in the rocks, and it is difficult to reconstruct from footprints the forms of massive vertebrates. On the other hand, surprising specimens come to light which help to fill in the growing record. Moulds of jellyfish occur at Eichstätt, and even in the earliest Cambrian strata of North America. The famous fossil bird Archæopteryx was first known by the impress of a feather; then by a headless skeleton showing both wings and tail. But these remains are now surpassed by a second skeleton, which reveals the skull with its toothed jaws. These specimens lead the palæontologist to comparisons with reptiles of the same geological age, and he is rewarded by the unique skeleton of a small and doubtless arboreal dinosaur, Compsognathus, the bones of which contain air-cavities like those of birds.

The amplification of knowledge in regard to forms already recognized may be further illustrated from the trilobites. Though these creatures were known to British palæontology in 1698, they gave no evidence of limbs. Hermann Burmeister, in his detailed studies of 1846, concluded that these flexible parts were so perishable as to have left no traces in the rocks. Recent researches, however, by C. D. Walcott, C. E. Beecher, and others have revealed the limbs in a remarkable series of American specimens. These observations have been greatly developed by P. E. Raymond in 1921, and indicate trilobites as the primitive stock from which all other crustacean lines diverge.

The restoration of mammalian skeletons from a mass of mixed material, such as that in the Lower Pliocene river-bed of Pikermi, requires the utmost knowledge of the osteology of modern forms. Such knowledge made the names of Georges Cuvier and Richard Owen famous; yet even in such cases the fortunate isolation of a complete skeleton may do much to aid us in appreciating the animals as they lived. The dry lands of the central states of North America have furnished a wealth of material, both reptilian and mammalian, and it is pleasant to remember that Owen lived to realize the fascination of the dinosaurs and ungulates disentombed by C. D. Cope and O. C. Marsh. Such specimens as the skeleton of Stenomylus, a gazelle-shaped ancestor of the camels, from the Lower Miocene of Nebraska, in which very little is due to restoration, mark the great enrichment of palæontological material since Cuvier published his *Recherches sur les ossemens fossiles de quadrupèdes* in 1812. Gideon Mantell discovered the remains of Iguanodon near Maidstone in 1825, and established the genus as reptilian; but more than fifty years elapsed before the full structure of the animal was elucidated by the unearthing of complete skeletons at Bernissart, near Mons, in Belgium.

The study of minute differences between allied organic forms has naturally led palæontologists, in common with botanists and zoologists, to multiply both genera and species, and to subdivide many genera that seemed at one time well defined. This is notably the case with the well-known group of the Ammonites. The study of these cephalopods was immensely extended by the discovery of a host of Triassic forms in the Eastern Alps, and Ammonites as a genus have long ceased to appear in classifications. We may become impatient of the laborious revisions that prevent our museum-labels from being ever precisely up-to-date; but the close scrutiny of details has a far-reaching result in indicating lines of descent and variation. The accumulated lists of names that meant so little to the early workers, who could only wonder at the infinite variety of creation, now represent to the palæontologist the basis of a wide philosophy. Problems of climate as well as of life-habit are raised by the tracing of closely similar or identical species on a given geological horizon over wide spaces of the globe. Equally interesting is the study of the parallel succession of genera, and even of species, in areas now separated by continental blocks or oceanic depths. Some species, in unfailing sequence, like the graptolites studied by C. Lapworth, mark out zones for the stratigrapher with a detailed precision that would have delighted William Smith.

Though the pioneers in geology were tempted to hang back, and to exclude human origins from their domain, the 'organized fossils' of man himself have now become a matter of palæontology. The proofs of the existence of past races, such as that named from the Neanderthal, which have been gathered from caves and prehistoric tombs, have been supplemented by casually deposited bones, such as the skull of *Eoanthropus Dawsoni* found in Sussex in 1911, and the massive jaw-bone, with its simian suggestions, dug out from under 75 feet of glacial strata at Mauer, near Heidelberg, in 1907. Already on the European continent there are schools of 'Human Palæontology', and the popular notion that the study of fossils is utterly dry and uninspiring will probably receive its death-blow from the anthropological aspects of the science.

Illustrations of the matters touched on above, and of many in the previous article on *Fossils*, will be found in the plates accompanying the present article.

BIBLIOGRAPHY: K. von Zittel, *History of Geology and Palæontology* (English translation); *Handbuch der Palæontologie*, and a smaller work, *Palæozoologie* (English version of the last by Eastman and others); A. M. Davies, *Introduction to Palæontology*; F. A. Bather, *Guide to the Fossil Invertebrate Animals in the British Museum*; A. S. Woodward, *Outlines of Vertebrate Palæontology*; also British Museum guides to fossil vertebrates; A. C. Seward, *Fossil Plants*.

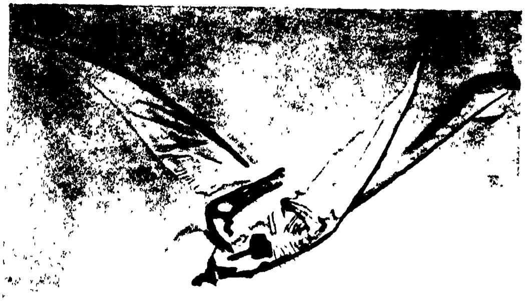
Palæothe'rium, an extinct genus of Ungulate or hoofed quadrupeds in the line of the horse, but with three toes, which all reach the ground. These animals resembled tapirs, and varied in size from a sheep to a horse. They had, in all probability, a short mobile snout or proboscis. This genus forms the type of the family Palæotheriidæ, which occur as fossils in Eocene and Miocene strata.

Palæozoic, the name of the geological era that includes the periods from the beginning of the Cambrian to the end of the Permian. In this 'old-life' era, all the classes and an immense number of the orders of invertebrate life are represented, and many now require to be traced to ancestors in Proterozoic times. At the close of the era, however, the vertebrates have not advanced beyond primitive types of reptiles. See *Geology*.

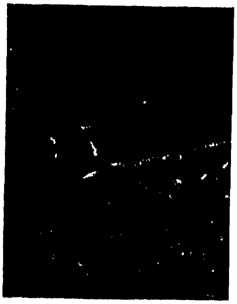
Palais-Royal (pȧ-lā-rwȧ-yȧl), a popular resort of the Parisians. The original palace, designed by Jacques Lemercier, was built (1629-36) by Richelieu, and by him presented to Louis XIII. It originally bore the name of Palais Cardinal, but after the death of Louis XIII (1643) the queen regent and the royal family established themselves in the palace, which from that time bore the name of Palais-Royal. It was confiscated by the Republicans in 1793, and the Tribunal sat in the palace during the Reign of Terror. At the Restoration it was repurchased by the duc d'Orléans, but in the Revolution of 1848 it was again appropriated to the State. In 1871 it was set on fire by the Communists, but has since been restored. The Théâtre Français, the Théâtre du Palais-Royal, and several shops form parts of the buildings of the Palais-Royal.

Palap'teryx (the 'ancient apteryx'), a genus of large struthious birds, whose remains are found along with those of the dinornis in the river-silt deposits and caves of New Zealand. Its remains show that it, like the gigantic dinornis, was closely allied to the living wingless apteryx.

Pal'ate, the name applied to the roof of the mouth. It consists of two portions, the *hard* palate in front, the *soft* palate behind. The former is bounded above by thé palatal bones, in front and at the sides by the alveolar arches and gums, being lined by mucous membrane; behind it is continuous with the soft palate. It supports the tongue in eating, speaking, and swallowing. The *soft palate* is a movable fold suspended from the posterior border of the hard palate. It consists of mucous membranes, nerves, and muscles, and forms a sort of partition between the mouth and the hinder nostrils. Its upper border is attached to the posterior margin of the hard palate; its lower border is free. The *uvula* hangs from the middle of its lower border, and on each side are two curved folds of mucous membrane called the *arches* or *pillars* of the *soft* palate. Between these on either side of the pharynx are the two glandular bodies known as *tonsils*. The upper surface of the soft palate is convex, the lower surface is concave with a median ridge, the latter pointing to the early or embryo stage of its formation, when it consists of two distinct parts. Non-union of these halves and of those of the hard palate constitutes the deformity known as *cleft palate*, often associated with hare-lip. Glands are abundant in the soft palate, secreting the mucus which serves to lubricate the throat during the passage of food. The soft palate comes into action in swallowing, and also in speaking, being of great importance



Pterosaur (Rhamphorhynchus)
U. Jurassic, Bavaria. $\frac{1}{7}$ n.s.



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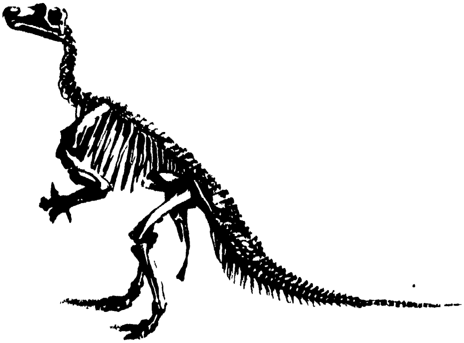
L. Jurassic, W



Iguanodon
Wealden Beds, Belgium. $\frac{1}{85}$ n.s.

Arch
U. Jurassic,

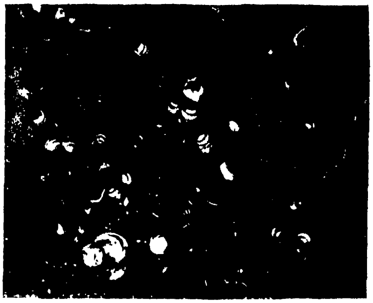
Footprints (probably Reptilian)
Trias, England. [illegible] n.s.

Mammalian Bones
L. Pliocene. Pikermi. $\frac{1}{18}$ n.s.

L. Mic

.s.

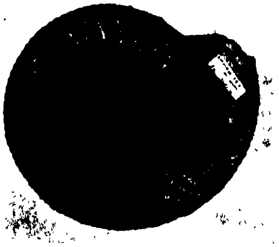
Shoal of Holoptychius
Old Red Sandstone, Fifeshire. $\frac{1}{18}$ n.s.



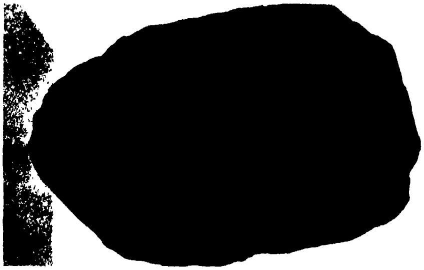
Molluscan Shells (Axinæa)
In London Clay, Hants. $\frac{1}{15}$ n.s.

Jelly-fish (Rhizostomites)
U. Jurassic, Bavaria. $\frac{1}{4}$ n.s

Skull of Neanderthal Man
La Chapelle-aux-Saints, Corrèze. $\frac{1}{10}$ n.s.



Ammonite (Parkinsonia)
M. Jurassic, Somerset. $\frac{1}{6}$ n.s.



Trilobite (Paradoxides)
Cambrian, Bohemia. $\frac{1}{3}$ n.s.

a. $\frac{1}{10}$ n.s

Graptolites (Didymograptus)
Ordovician. Pembrokeshire. $\frac{2}{3}$ n.s.

Plant-remains (Dactylotheca)
U. Carboniferous, Yorkshire. $\frac{1}{4}$ n.s.

in the utterance of certain sounds. The special use of the uvula is not well known. It is often relaxed or enlarged, causing a troublesome cough.

Palat'inate (Ger. *Pfalz*), a district of Germany which, before the Revolution of 1918, was under the rule of counts-palatine (Pfalzgrafen), and consists of two separate portions distinguished as the Upper and Lower Palatinate. See *Bavaria.*

Palat'ka, a city and port of entry of Florida, United States, the county seat of Putnam county, on the St. John's River, and served by the Atlantic Coast line, Florida East Coast & Georgia Southern, and Florida Railways. It is a terminal station of the latter. At the head of ocean navigation on the St. John's River, it has a coastal shipping trade with New York and other ports. There is a large trade in agricultural produce. Palatka became a city in 1872. Pop. about 5000.

Palazzo'lo Acreide, a town of Sicily, 28 miles west of Syracuse. Here are the remains of the ancient city of Acrae, founded by Syracuse 663 B.C. Pop. 15,140.

Pale, The, or **The English Pale**, a name formerly given to that part of Ireland, in Dublin, Kildare, Meath, and Louth, which was completely under English rule, in distinction to the parts where the old Irish laws and customs prevailed.

Paleæ (pā'lē-ē), in botany, the bracts or pales enclosing the individual flowers of grass.

Palembang', a town of Sumatra, capital of the Residency of same name, on the Moosi, here called the Palembang. There is a population of 60,000, partly inhabiting houses raised on piles, and partly living on rafts moored in the river. Its port is one of the best in the Malay Archipelago. The Residency has an area of 32,580 sq. miles; pop. 600,000.

Palencia, a province of Spain. It is fertile and watered by the Carrion and Pisuerga. The manufactures include paper, porcelain, and leather. Area, 3256 sq. miles; pop. 196,550.

Palen'cia, a town of Northern Spain, capital of the province of same name, situated on the Carrion, an affluent of the Pisuerga. It is a bishop's see, and has a fine Gothic cathedral dating from the fourteenth century. The manufactures include shawls, blankets, agricultural machinery, &c. Palencia is the ancient Pallantia, capital of the Vaccaei. It became the seat of the Castilian kings in the twelfth century. The University of Palencia, founded in 1208, was transferred to Salamanca in 1239. Pop. 18,000.

Paler'mo (ancient **Panormus**), a seaport, capital of Sicily, beautifully situated on the north coast. It is built in the form of an amphitheatre facing the sea, and is divided into four quarters by two main streets. It has a fine sea-front, public gardens and fountains, electric tramways, &c. Its public edifices include a cathedral of the tenth century which contains monuments of the Emperor Frederick II and King Roger the Norman. Other notable buildings are several churches; a royal palace of Saracenic origin, amid beautiful gardens, containing the chapel of King Roger, called Cappella Palatina (Palatine Chapel), built in a mixed Saracenic and Norman style, and dating prior to 1132, having the walls entirely covered with rich Byzantine mosaics on a golden ground; the National Museum and picture gallery, containing some of the oldest monuments of Greek plastic art to which a definite date can be assigned (sixth century B.C.); the archiepiscopal palace, the custom house, the university, three theatres, and numerous other structures of architectural interest. The port is enclosed by a mole 1300 feet in length. Palermo is the residence of the military commandant of the island, and has an arsenal and shipbuilding yards. The manufactures consist chiefly of silks, cottons, oil-cloth, leather, glass, and gloves. The principal exports are sumach, wine and spirits, fruits, sulphur, skins and hides, olive-oil, essences, cream of tartar, asphalt, &c.; imports, colonial produce, woollen, cotton, and silk tissues, hardware, earthenware, &c. The fisheries are very productive, and give employment to nearly 40,000 hands. Founded by the Phœnicians, Palermo afterwards became the capital of the Carthaginian possessions in Sicily. It was called by the Romans Panormus, and taken by them in 254 B.C. The Saracens held it for a time, and in 1072 it fell to the Normans. The German emperors and the French subsequently held it, and since the Sicilian Vespers (1282) it has shared the fortunes of the Sicilian Kingdom. The court of Naples resided here from 1806 to 1815. Garibaldi captured the town in 1860. Pop. (1915), 345,890.

Palermo, a mountainous maritime province of Northern Sicily, traversed by railways along the coastal fringe. Citrus-growing is extensive; sulphur and wines are produced. Area, 1927 sq. miles; pop. 800,000.

Pal'estine, a maritime country of the Mediterranean administered by Great Britain, under mandate from the League of Nations, as a Jewish national home. It is a small, oblong piece of territory, bounded by the Mediterranean on the west, the Syrian Desert on the east, by a line running from west of Rafa to east of Taba, at the head of the Gulf of Akaba (i.e. along the Hejaz-Egyptian frontiers), and on the south and north by a line not yet entirely delimited, but settled by the Franco-British Convention of 23rd Dec., 1920.

Physiography.—Concentrated in the narrow strip between sea and desert there are three distinct natural regions. Along the low, unbroken coast is the maritime plain of Philistia and Sharon. Separating the maritime plain and the Rift Valley are the highlands of Judea and Samaria. In the east is the Rift Valley, drained by the Jordan (q.v.), linking the series of lakes. Beyond the Rift Valley is an eastern range, which fronts the wide wastes of the deserts beyond.

Jordan Valley.—The Jordan Valley forms one of the most extraordinary features in the world. It marks the end of a great line of faulting that can be traced from the flanks of the Lebanon Mountains, south through the Gulf of Akaba to the great lakes of Africa. It forms a great depression, which falls from sea-level to 1278 feet below sea-level in the Dead Sea, and the bottom of the Dead Sea is probably another 1300 feet deeper. Three principal streams, viz. the Nahr-el-Leddan, the Nahr Baniyas, and the Nahr Hasbani, unite in the Plain of Hule (150 feet altitude) to form the headwaters of the Jordan, which winds through the morass of the Hule and falls by a series of cataracts and waterfalls (at the rate of 65 feet to the mile) to the Lake of Galilee (Tiberias), which lies in a great rock basin 682 feet below sea-level. Leaving the Lake of Galilee, the waters become turbid and eventually fall into the Dead Sea. The salinity of the Dead Sea is its remarkable feature. In consequence of extraordinary evaporation the water is impregnated with 26 per cent of mineral salts, and is extremely buoyant. *Highlands.*—The highlands, of porous limestone, vary in height between 1500 and 2000 feet, and fall precipitately to the Jordan Valley. The Pass of Shechem marks a break where the mountains are continued seaward by the ridge of Carmel (1810 feet altitude), north of which lies the Plain of Esdraelon, which forms the natural link between the interior valley and the sea, and separates the mountains of the north from the highlands of the south. The highest points are Tell Asur (3318 feet altitude), near Beth-el, and Ebal (3077 feet altitude).

Climate. — The wide differences in altitude which are experienced in such a confined area lead to a corresponding range of climatic conditions, but broadly there are only two seasons —a dry, hot summer, and a rainy but comparatively warm winter. Three climatic zones may be distinguished: the humid, subtropical coastal belt; the mountains with a temperate and drier climate; and the unhealthy tropical depression of the Ghor. There are very great daily variations in temperature. Frost seldom occurs on the coast, and never in the Jordan Valley, but in the mountains snow falls and frost is not infrequent from December to February. About the end of November the rainy season begins, but about five-ninths of the total fall occurs in January and February, and one-third from mid-March to the end of April. The sirocco sets in in May and again in October, the thermometer rising to 100° F. or more. A light sea-wind arises almost every morning and blows till sundown, when the cooler land-breeze begins.

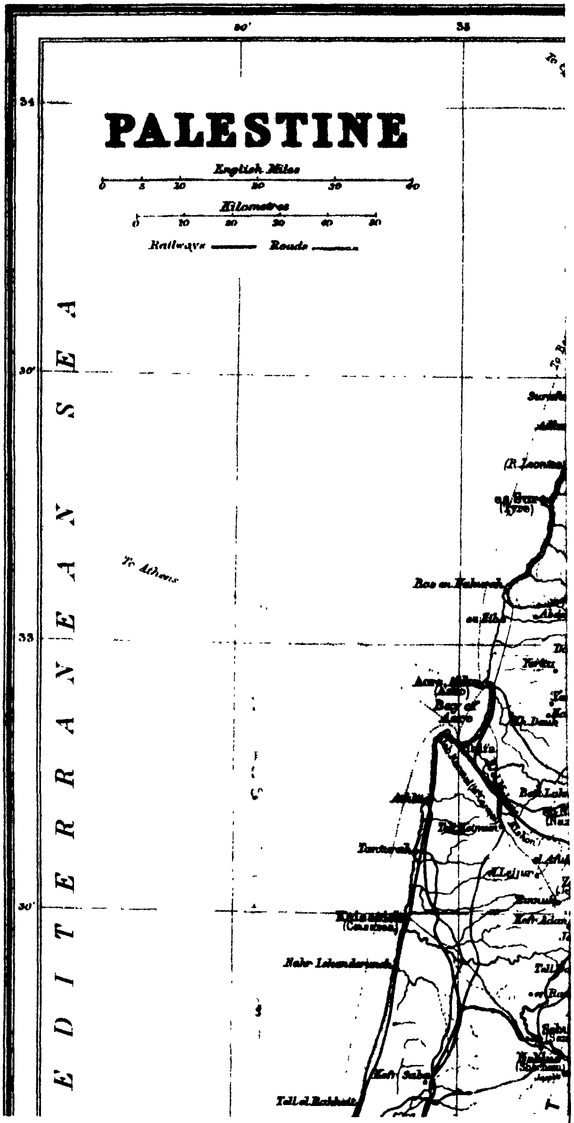
Social Conditions: Race. — The predominant race is Mussulman-Arab, but the Jews are rapidly increasing, mainly by immigration from Russia and Roumania, and have caused much controversy by bringing with them the new Russian form of 'kultur'—Bolshevism, a doctrine with which the (Mussulman) Arabic-speaking population is entirely at variance. There are also some Christians, Druses, and Samaritans. *Languages.*—Official languages are English, Hebrew, and Arabic. *Education.*—There are 123 State-maintained schools, and 53 in part State-owned. Agricultural schools (Jewish) are located at Mikweh-Israel and Petach-Tikvah: a high school (Jewish) at Jaffa, and Jewish agricultural experiment stations at Atlit and Zichron-Jacob. At Jerusalem two Government training colleges for men and women, a school of pharmacy, a law school, and a technical college are maintained. *Zionism.*—The Zionist organization has created considerable European controversy by its policy as regards the social conditions and political status of the non-Jewish population of Palestine (see *Zionism*). *Currency.*—Egyptian currency is legal tender, the £E of 100 piastres or 1000 millèmes being equivalent, normally, to £1, 0*s.* 6*d.* sterling, i.e. £1 sterling = £E 0·975. Turkish coinage in gold and silver is generally acceptable, but Turkish notes are forbidden as legal tender. *Weights and Measures.*—There are special local systems of length and area, weights, and capacity.

Communications: Railways. — The following principal railways are in operation:

1. Kantara—Al-Arish—Rapha—Ludd—Tulkeram—Haifa, 257 miles.
2. Japha—Lydda—Jerusalem, 54 miles.
3. Raphaih—Beersheba (Bir-es-Seba), 37 miles.
4. Haifa—Al-Afuleh—Al-Hamme, 60 miles.
5. Haifa—Acre, 11 miles.
6. Afuleh—Jenin—Nablus (Shechem)—Tulkeram, 61 miles.

There were 625 miles of track in Jan., 1921. During 1922 the Kantara-Raphaih section was operated by the Palestine Railways under War Office authority, and was known as the 'Sinai Military Railway'. Until 1892 internal communication was entirely by caravan over trade routes. On 26th Sept., 1892, the Japha (Jaffa)-Jerusalem Railway was opened. The Haifa-Damascus route was opened in 1905. It crosses the Great Plain of Esdraelon, and traverses the Ghor to Semarh (Sea of Galilee), where it swings round and follows the valley of the Yarmur to join the Syrian Railway at Edrei (Ed Dra'a), with extensions to Mecca and Medina.

Roads.—In 1922 there were over 520 miles of highways throughout Palestine. *Shipping.*—Japha and Haifa are the principal ports, but Acre and Gaza are also important. Seventeen


30'
35
34
PALESTINE
English Miles
0 5 10 20 30 40
Kilometres
0 10 20 30 40 50
Railways
Roads
EDITERRANEAN SEA
To Athens
30'
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es Sur
(Tyre)
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ez Zib
Acre
(Akka)
Bay of Acre
Haifa
Athlit
Tantura
Kaisariyeh
(Caesarea)
Nahr Iskanderuneh
Kefr Saba
el Lejjun

shipping lines maintain an international and inter-Palestinian coastal service. The British *Prince* line runs a weekly steamer; others are the Khedivial Mail, Lloyd Triestino, Affréteurs Réunis (weekly), Messageries Maritimes, Dutch Oriental, and Maritimi Italiani (bi-monthly).

Production: Agriculture.—The full development of Palestine is largely potential. It is essentially an agricultural country. Ezekiel, the prophet, referred to the export of wheat from Tyre, and this wheat came from the land of Judah, but from the name ‘ wheat of Minnith ’, by which nomenclature it was distinguished, it must originally have been raised to the east of Jordan, where Minnith is located. This simply means that Minnith wheat was imported wheat, and it probably came from the Haurán (the ancient land of Bashan, now known as the Nukrah). In the time of Ezekiel the east Jordan lands were the granary of Palestine, but Palestine under British mandate lies only west of Jordan, and the wheat-yield of these lands, although not comparable economically with that of Transjordania, is nevertheless astounding when consideration is given to the poorness of the soil and the unsuitable conditions under which crops are raised. The principal farm crops are wheat, barley, millet, olives, melons, and lentils. Sheep, goats, and camels are raised. Before the European War cotton was gradually being introduced into the Jewish agricultural colonies. Where the translators of the Authorized Version of the Bible have set down ‘ linen ’ or ‘ flax ’, ‘ cotton ’ might well be read, and is more probably correct. The ‘ tree-linen ’ with which Rahab covered the two spies is undoubtedly cotton. Yakut, the Arab geographer, mentions the plant (A.D. 1225), and Abu’l-Fida says (A.D. 1321) that cotton was exported from Palestine to Ceuta (Morocco). *Forestry.*—Re-afforestation is being undertaken by the Government.

Minerals.—Palestine is rich in limestone; sandstone is found in the coastal regions; rock-salt is abundant in the Ghor; and gypsum is found in parts. Sulphur is worked in the Dead Sea littoral. Near Tiberias there are mineral-springs.

Industries.—Soap for export is the chief manufacture of Jerusalem, and is also made in Nablus and Haifa. Olive-oil is manufactured at Nablus and elsewhere, and wine-making is virtually a monopoly of the Jewish colonies.[1]

Exports and Imports.—Exports include oil, soap, peas, melons, wine, and oranges (from the Jaffa district). The latter are exceptionally thick-skinned, and are more suitable for transport than any other competitive oranges on the market. The best are sent to Liverpool, which receives some two-thirds of the crop. Egypt and Turkey take the remainder. Each orange crop is worth over £2,000,000. Imports are confined mainly to rice, sugar, petroleum, and cottons.

Towns.—The growing towns of the interior are situated at advantageous points on the railways and trade routes, e.g. Nablus, Jerusalem, Beth-el, and Hebron—old strongholds in the Judæan highlands. Jerusalem is of vast strategic importance, and marks the point where the highway from the Levant makes for the Rift Valley.[1]

Haifa is the natural outlet for the rich wheatlands of the Haurán, but will depend, for its future importance, upon a vast improvement in railway and harbour works.

Government. — For administrative purposes, Palestine has been divided into the seven districts of Jerusalem, Jaffa, Gaza, Bir-es-Sheba, Samaria (Nablus), Nazareth (Galilee), and Haifa (Phœnicia).[2] These are administered by Governors. The executive (a *de facto* dictatorship) is in the hands of a High Commissioner, and the appointment of a Jew (Sir Herbert L. Samuel, P.C., G.B.E.) to this post in July, 1920, was a fundamental blunder. The ostensible aim of the British Government, in accordance with the Balfour Declaration (see *History*—this article), is to make Palestine the Jewish national home, without prejudicing the non-Jewish communities within the mandatory area, who will be entitled to claim equal religious and political rights. In Palestine the task of forming this Jewish Utopia is in the hands of the Palestine Zionist Executive, a branch of the World Zionist Organization which is officially recognized by the British Empire and by the Palestinian administration. There is an Advisory Council comprising the heads of Government departments and 10 unofficial members (4 Muslims, 3 Christians, and 3 Jews). A National Committee, elected by an elected assembly convened by the Jews of Palestine, acts as an intermediary between the Jewish peoples and the administration.

Area and Population.—The mandatory region has an area of 9000 sq. miles approximately, and lies entirely west of Jordan. Pop. (1st July, 1921), 770,000 (600,000 of Mahommedan belief, 84,500 Christians, 80,000 Jews, 6000 Druses, and 200 Samaritans).

See *Zionism*; *Jerusalem*; *Jordan*; *Dead Sea*; *Syria*; *Lebanon*; and other articles.

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[1] It could not be otherwise, when it is remembered that wine is prohibited by the *Koran*, and the Muslim element can neither make it nor trade in it if they follow the precepts of the Prophet with any faith.

[1] Strategically, Palestine is the most vitally important section of the ‘ highway out of Egypt to Assyria ’, and its possession is of paramount value to the control of the Suez route to the East. Hence the Palestinian operations during the European War (q.v.).

[2] Under Turkey there were three administrative divisions, viz. an independent Sanjak of Jerusalem, and Sanjaks of Acre and of Nablus. These had a total area of 13,724 sq. miles, and a pop. of roughly 680,000.

History.—The name Palestine, from the Hebrew *Pelescheth,* means the land of the Philistines. It is properly only applicable to the south-west part of the country. The ancient name of the country was Canaan, and when thus named, in the time of the patriarchs, it was parcelled out among a number of independent tribes, all probably Semitic. In the time of Moses the district east of the Jordan was taken and divided among the tribes of Reuben and Gad, and the half-tribe of Manasseh; and latterly the whole territory was apportioned among the twelve Jewish tribes (see *Jews*). In the time of Christ Palestine was held by the Romans, and was divided into the four provinces of Galilee, Samaria, Judea, and Perea. In A.D. 636 the battle of Ajnadain was followed by the capitulation of Jerusalem and the surrender of Palestine to Islam. Cæsarea was the last to hold out, and was taken by storm in 638. The severities exercised towards Christians gave rise to the Crusades, and the eastern shores of the Mediterranean passed from the domination of the Mahommedans after the taking of Jerusalem by the Crusaders in 1099. At this time a Christian kingdom was established, but when Saladin won the battle of Hittin (1187), the collapse of the Christian power was so complete that within three years only Antioch, Tripolis, and Tyre remained in Christian hands. Despite their almost superhuman efforts to recover the Holy Land, the treaty of 1192 left the Crusaders little territory beyond the seaboard from Acre to Jaffa.

Saladin died in 1195, and his empire, which then extended from the Euphrates to the Nile, was partitioned among his family, although the actual rulers of Egypt would appear always to have had first claim on Syria in general. Under the Mamluks, who supplanted the dynasty of Saladin, Egypt and all Syria formed for 267 years (1250–1517) one united kingdom, and was unsuccessfully attacked during that period by the Crusaders, by the Mongols under Hualagu, the grandson of Genghis Khan (1260), and by Timour the Lame (Tamerlane), who took Syria in 1402. Palestine and Egypt both fell to the Osmanli Turks in 1517, in whose hands they remained for 400 years. Palestine was conquered by British Empire forces in Allenby's campaign of 1917–8, Jerusalem surrendering to General Allenby on 9th Dec., 1917. Until 1st July, 1920, Palestine was under a military administration, and was handed over on that date to a civil administrator (Sir Herbert Samuel). The Treaty of Sèvres (10th Aug., 1920) provided for the abandonment by the Ottoman Empire of all sovereign rights over the Holy Land. This caused a considerable amount of political controversy between officials of the British Empire at home and abroad, and was incidentally responsible for the non-co-operation and *swaraj* movements in India during 1921–2.[1] Palestine was conquered partly by the assistance of Mahommedan troops, including Indian soldiers of the Muslim faith. Before entertaining war with Turkey, and before agreeing to serve in arms, not only against co-religionists but against the 'Caliph of Islam', i.e. the Sultan of Turkey, who is always mentioned in Friday prayers and in the Friday Sermon, these Muslim soldiers had to be assured that there was no question of a religious issue in the contemplated war, and they demanded British guarantees for the integrity of the Sultanate and for the preservation of the holy places of Islam to the recognized Caliph. These guarantees were given in good faith by Mr. Lloyd George, who was subsequently a party to the partition of Turkey which has raised a storm of dissent throughout the Mahommedan world. To the Muslim, Palestine is sacred ground, second only in importance to Mecca and Medina, or, in the case of Persian Shiites, to that of Kerbala. According to Mahommedan tradition, Mahomet made his ascent into Paradise from the Aksa Mosque at Jerusalem, to which he had been transported from Mecca in a single night.

Despite Muslim protest, a draft mandate was submitted to the League of Nations in Dec., 1920, and was entrusted provisionally to the British Empire, as agreed upon by the Supreme Allied Council at San Remo (25th April, 1920). The Balfour Declaration of 2nd Nov., 1917,[2] had as its object the provision of a Jewish national home in Palestine, and this was embodied in the Treaty of Sèvres.

The Future of Palestine.—Much has been said about the development of Palestine, its future prospects, and the probable effects of concentrating a small number of Jews in a territory that is overwhelmingly Muslim. In its whole history Palestine has never formed a politically independent state, excepting in name. Three distinct faiths, Christian, Jew, and Mahommedan, have direct claims upon the country. Of these, the Christian has treated the country with least respect; he has sought to wax rich by exploiting the pious pilgrims, and he ranks third in respect of religious toleration. To the Jew Palestine is less sacred than it is to the Christian, whose Founder and Saviour lived, suffered, and was martyred within its confines, but the Jew's claim is the oldest historically, and he at least believes that his progenitors, Abraham, Isaac, and Jacob, lie buried under the floor of the mosque in Hebron. The cradle of the Jewish race was either Mesopotamia or Egypt, and not Palestine, in which the founder of the Jewish faith never even set foot. Apart from the Muslim belief in the translation of Mahomet to Paradise from Jerusalem, the Arab as well as the Jew claims descent from Abraham, and has a profound belief in all the Jewish prophets. Again, the mosque of Omar, which stands on the site of the Hebrew temple, is especially sacred to all three contending faiths. The Jew accepts Moses but rejects Christ and Mahomet; the Christian accepts both Moses and Christ but not Mahomet; and the Mahommedan accepts all the three, Mahomet, Christ, and Moses, as prophets, and in virtue of such recognition he would appear to have a paramount right to the custody of the holy place of civilization.

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[1] The connection between these two happenings may not be intelligible from a superficial examination of them. The Pan-Islamic movement in days before the European War was actively propagated by Abdul Hamid II and by the Young Turk Committee of Union and Progress, and found some considerable support among the Mahommedans of Northern India. Although politically disunited, the common possession of one Sacred Book, and of a more or less common political ambition, and the recollection of the glorious early history of all-conquering Islam, unites them more or less in thought, and Muslim states are always ready, therefore, to sympathize both actively and passively in the misfortunes of their brethren and to rejoice whole-heartedly in their successes. The growing fear of European domination has tended, as it always will, towards a grudging moral support of the only powerful Mahommedan nation that remains in existence. And this despite the fact that statistics prove the more rapid spread of Muslim faith and thought in countries under European protection than in independent Mussulman states. See *Pan-Islamism.*

[2] The Declaration reads: "His Britannic Majesty's Government view with favour the establishment in Palestine of a national home for the Jewish people, and will use their best endeavour to facilitate the achievement of that object, it being clearly understood that nothing shall be done which may prejudice the civil and religious rights and political status enjoyed by Jews in any other country".

Despite the prolonged period of Turkification endured by Palestine, which was especially intensified by the doctrine of Pan-Islamism (q.v.) under the reign of Abdul Hamid II and under the Young Turk Committee of Union and Progress, the three powerful religions are still in existence side by side, and the future of Palestine will only be definitely settled by an adjustment of their differences. See *Zionism*; *Turkey*.

BIBLIOGRAPHY: A. R. Hope Moncrieff, *New World of To-day* (with economic data); *Foreign Office Handbook* (with bibliography); Baedeker's *Palestine and Syria* (1911 edition, with chief routes through Palestine and Syria); J. Ball, *Geography and Geology of West Central Sinai*; E. Grant, *The People of Palestine*; O. H. Lock, *The Conquerors of Palestine*; N. Wiltushewitz, *The Industrial Development of Palestine*.

Palestine Exploration Fund, a British archæological research organization, with headquarters in London, founded in 1864 for the promotion of excavation work in Palestine and Syria. Many expeditions have been organized, including, 1865–6, preliminary survey led by Captain Wilson; 1867–70, survey led by Lieutenant Warren; 1872–7, survey of Western Palestine and Cyprus; 1881, survey of Eastern Palestine; and 1890–1903, excavations at the buried cities of Tel-al-Hesi, associated with the name of Flinders Petrie. During 1920 operations were resumed.

Palestri'na, Giovanni Pierluigi (or Pietro Aloisio) da, Italian musical composer, born at Palestrina, from which he took his name, in 1524, died in 1594. In 1551 he was appointed by Pope Julius III master of a choir of boys in the Julian Chapel, and was the first to receive the title of chapel-master. In 1554 he published a first collection of Masses, and Julius admitted him into the college of choristers of the Pope's chapel. He was dismissed by Pope Paul IV in 1555, but in the same year he was appointed chapel-master of San Giovanni in Laterano. In the meantime the Council of Trent, on reassembling in 1562, pointed out the necessity of a reform in church music, which had become vulgar and profane. A commission was appointed, and Palestrina composed three beautiful Masses which created quite a revolution in sacred composition. One of them, the *Missa Papæ Marcelli*, is still celebrated. In 1571 Palestrina was appointed chapel-master of the Basilica San Pietro in Rome. A complete edition of his works was published in Leipzig between 1885 and 1898 (33 vols.).

Palestri'na (ancient **Præneste**), a city of Central Italy, province of Rome. It is of Greek origin, and had become important long before Rome existed. Under the Roman Empire the town attained great magnificence, and was often the residence of the emperors. Palestrina has numerous ancient remains, noteworthy among which are those of an immense Temple of Fortune. Among modern buildings the most noteworthy is the Barberini Palace. Pop. 7000.

Paley, Frederick Apthorp, grandson of the following, was born in 1816. Educated at Shrewsbury, he went afterwards to St. John's College, Cambridge, and took his degree in 1838. In 1846 he became a Roman Catholic, and in 1874 accepted the post of professor of classical literature in the Catholic College at Kensington. He died in 1888. His best title to fame rests on the valuable work he did as editor and annotator of classical texts, especially Æschylus and Euripides.

Paley, William, British theologian, born at Peterborough in 1743, died 1805. Educated at Christ's College, Cambridge, he graduated B.A. as Senior Wrangler in 1763, and M.A. in 1766, and subsequently became a Fellow and tutor of his college. At the age of twenty-four he was ordained. In 1780 he became prebendary of Carlisle, and in 1785 chancellor of the diocese. In 1794 he was made prebendary of St. Paul's and sub-dean of Lincoln; and in 1795 he received the rectory of Bishop-Wearmouth. He also received in this year the degree of D.D. from Cambridge University. His chief works are: *The Principles of*

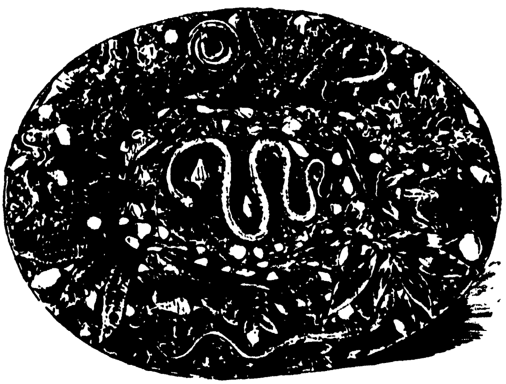
Moral and Political Philosophy (1785); *A View of the Evidences of Christianity* (1794); *Natural Theology, or Evidences of the Existence and Attributes of the Deity collected from the Appearance of Nature* (1802), founded on a work by Nieuwentyt, a Dutch philosopher. Paley's system of moral philosophy is founded purely on utilitarianism. He was a strenuous supporter of Wilberforce and Clarkson in their efforts to abolish the slave-trade.

Palgrave, Francis Turner, British poet and critic, was born in London in 1824, and died in 1897. Educated at Charterhouse and Balliol College, Oxford, he became a Fellow of Exeter College. For some years he held a post in the Education Department, and from 1885 to 1895 was professor of poetry at Oxford. His literary works include: *Idylls and Songs* (1854), *Golden Treasury of the Best Songs and Lyrical Poems* (1861), *Sonnets and Songs of Shakespeare* (1865), *Essays on Art* (1866), and *Selected Lyrical Poems of Herrick* (1877).

Pâli, the sacred language of the Buddhists. It is the language in which the oldest religious, philosophical, and historical literature of Buddhism is written, and is especially the language of the sacred books of the Buddhists of Ceylon, Burmah, and Siam; but it is no longer spoken anywhere, though a corrupt form of it is to some extent used for literary purposes. The language appears to have been derived immediately from Sanskrit, to which it is as closely related as Italian is to Latin. Like Prakrit, however, Pâli, as compared with classical Sanskrit, shows a marked decadence. The study of Pâli was introduced into Europe by Lassen and Burnouf. One of the most interesting portions of the Pâli literature is the collection of folklore known as the *Iatakas*. Pâli works of a non-sacred character are: the *Dipavamsa*, a history of Ceylon to A.D. 300; the *Mahavamsa*, another history of Ceylon, written about the end of the fifth century A.D.; and the *Rasavahini*, a collection of fables and legends.—Cf. *Journal of the Pâli Text Society*.

Palicourea (pā-li-kŏ'rē-a), a genus of plants, nat. ord. Rubiaceæ, tropical American shrubs, with flowers of various sizes in compound thyrses or corymbs. *P. officinalis* is reported to be a powerful diuretic, and *P. tinctoria* forms a fine red dye, much valued in Peru. *P. densiflōra* yields coto bark.

Pal'impsest (from Gr. *palin*, again, *psēstos*, rubbed), a manuscript prepared by erasure for being written on again, especially a parchment so prepared by washing or scraping. This custom was brought about by the costliness of writing materials, and was practised both by the Greeks and Romans, and in the monasteries, especially from the seventh to the thirteenth centuries. It was in the seventh century, when the conquests of the Caliph Omar had cut off from Europe the supply of papyrus furnished by Egypt, that a great deficiency in the supply of parchment began to be felt. The scarcity continued until the general use of parchment was superseded by paper. That which replaced the ancient manuscripts was nearly always some writing of an ecclesiastical character. The parchments which have been scraped are nearly indecipherable. At the Renaissance attempts were made to decipher the ancient and underlying writing, but for want of chemical appliances the attempts were generally unsuccessful. It was only in the eighteenth century that decided progress was made. Those which have been washed have often been revived by chemical processes. Fragments of the *Iliad* and extensive portions of many Greek and Roman writers have been recovered by these means.—Cf. Sir E. M. Thompson, *An Introduction to Greek and Latin Palæography*.



Palissy Ware Dish

Palissy, Bernard, a French artist and philosopher, born about 1510, died in 1590. He was apprenticed in a glass-work at Agen, where he learned the art of painting on glass. He then travelled in Germany, returning to France in 1535. At Saintes, where he settled, he started to make experiments, resolved to discover the mode of producing white enamel. After sixteen years of unremunerated labour (1538–54), he at last obtained a pure white enamel, affording a perfect ground for the application of decorative art. He was now able to produce works in which he represented natural objects grouped and portrayed with consummate skill, and his enamelled pottery and sculptures in clay became recognized as works of art. In 1562 he went to establish himself at Paris, where he continued to work at his art, and also delivered scientific lectures, which were attended by the most distinguished men in Paris, and contained views far ahead of his time. Palissy suffered persecution as a Huguenot, was arrested in 1589, and thrown into the Bastille, where he died. His *Œuvres complètes* were edited by Anatole France in 1880.—Cf. Henry Morley, *Palissy the Potter*.

Palissy Ware Jug

Palitana, a native state of Kathiawar Peninsula, Bombay province, India. It contains Satrunjaya, a holy mountain covered with Jain temples and overlooking Palitan (pop. 14,000), the state capital. A railway runs to Ahmadabad, with connections to Bhavnagar and Mehsana. Sugar, cereals, and cotton are produced. Area, 290 sq. miles; pop. 70,000.

Paliu'rus, a genus of deciduous shrubs, natives of the south of Europe and Asia Minor, and belonging to the nat. ord. Rhamnaceæ. See *Christ's-thorn*.

Palk Strait, a channel between the mainland of India (Deccan) and the north part of Ceylon, abounding in shoals, currents, sunken rocks, and sand-banks. It is called after Palk, who was Governor of Madras in 1764.

Pall, a covering of black velvet thrown over a coffin while being borne to burial, the ends of which in a walking procession are held by the friends of the deceased. In another sense the pall or *pallium* is an ecclesiastical vestment sent by the sovereign pontiff on their accession to patriarchs, primates, and metropolitans, and sometimes, as a mark of honour, to bishops. It is made of white lambs' wool, and consists of a narrow strip of cloth encircling the neck and shoulders, with two narrow pieces hanging down, all embroidered with crosses.

Palladian Architecture, a species of Italian architecture due to Palladio, founded upon the Roman antique as interpreted by the writings of Vitruvius, but rather upon the secular buildings of the Romans than upon their temples. It is consequently more applicable to palaces and civic buildings than to churches. A characteristic feature of the style is the use of engaged columns in façades, a single range of these often running through the two principal stories. It was introduced into England by Inigo Jones, a follower of the Venetian school of Palladio.

Palla'dio, Andrea, one of the greatest classical architects of modern Italy, was born at Vicenza in 1518, died at Venice in 1580. He studied at Rome, came under the influence of the work of Vitruvius and of Alberti, and on his return to Vicenza he established his fame by his designs for many noble buildings both there and in other parts of Italy, notably among them being the Palazzo della Ragione. From 1560 he erected many buildings at Venice, among them the churches of S. Giorzio Maggiore and of the Capuchins, and some of the palaces on the Grand Canal. He also designed many country villas in different parts of North Italy. He was the author of a *Treatise on Architecture*.

Palla'dium, a wooden image of Pallas Athene which is said to have fallen from heaven, and to have been preserved in Troy. The Trojans believed that their city would be invincible so long as it contained the Palladium. The Romans pretended that it was brought to Italy by Æneas, and preserved in the temple of Vesta at Rome, but several Greek cities claimed to possess it.

Palla'dium, a metal discovered by Wollaston in 1803, and found in small quantity associated with native gold and platinum. It closely resembles platinum, but is harder, lighter (specific gravity, 11·4), and more easily oxidized; symbol, Pd; atomic weight, 106·7. It has been used for dental purposes, for making scientific instruments, and for absorbing hydrogen. At the ordinary temperature it absorbs many times it own volume of hydrogen.

Pallas, one of the minor planets revolving round the sun between Mars and Jupiter. Its orbit is inclined 35° to the ecliptic. It was discovered in 1802 by Olbers at Bremen, being the second minor planet to be found. It revolves round the sun in 4·61 years. Professor Barnard estimated its diameter at about 300 miles.

Pall-mall, an ancient game, in which a round box-wood ball was with a mallet or club struck through a ring elevated upon a pole, standing at either end of an alley, the person who could do so with fewest blows, or with a number agreed on, being the winner. The game, introduced during the reign of Charles I, was formerly practised in St. James's Park, London, and gave its name to the street called Pall Mall.

Palma, an episcopal city of Spain, capital of the Island of Majorca and of the Spanish province of Baleares. It is built in the form of an amphitheatre, and enjoys an extremely mild and salubrious climate. The principal public buildings are the cathedral, dating from the thirteenth century, the exchange, the Governor's palace, and the town house. There are normal and nautical schools, a school of fine arts, two public libraries, and a museum. Shipbuilding-yards employ numerous hands. Pop. 67,544.

Palma, or **San Miguel de la Palma**, the most north-westerly of the Canary Islands; area, 280 sq. miles; capital, Santa Cruz de la Palma, the principal port. It consists for the most part of elevated mountains, and in the north the coast is high and precipitous. The climate is agreeable and healthy, and the soil fertile. Besides a small quantity of grain, La Palma produces wine, fruits, sugar, honey, wax, and silk. Pop. 42,000.

Palma di Montechiaro (mon-tā-kyä'rō), a town of Sicily, in the province of Girgenti. The castle of Montechiaro crowns the summit of a hill to the west of the town. Pop. 14,210.

Palmate, in botany, formed like a hand. A palmate or digitate leaf is a compound or lobed leaf in which the leaflets or lobes diverge like the fingers of a hand, as in horse-chestnut or castor-oil plant.

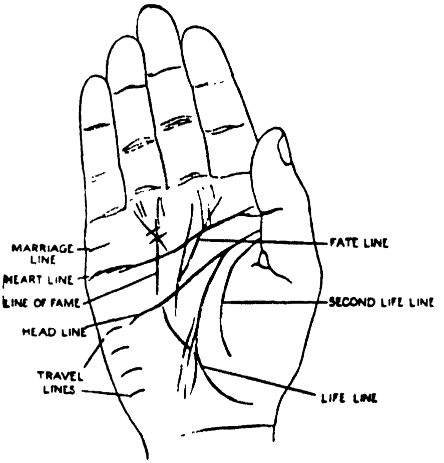
Palmer, Edward Henry, English Oriental scholar, born at Cambridge 1840; graduated at St. John's College in 1867. He was a member of the survey expedition to Sinai (1868–9) and to Moab (1869–70), and on his return became professor of Arabic at Cambridge (1871). In 1882 he was killed by the Arabs in the Sinaitic Peninsula. Among his numerous works are: *Oriental Mysticism* (1867), *The Desert of the Exodus* (1871), *A History of the Jewish Nation* (1874), and *A Persian-English Dictionary* (1876).

Palmerston (pä'mėr-stun), Henry John Temple, Viscount, English statesman, was born in Westminster 1784, died 1865. Educated at Harrow, Edinburgh University, and St. John's College, Cambridge, he succeeded his father in the title (an Irish one) in 1802. In 1807 he was returned as member for Newport, Isle of Wight, and became Junior Lord of the Admiralty in the Duke of Portland's administration. In 1809 he became Secretary of War, and two years later he was elected member for Cambridge University. He was a supporter of Catholic emancipation, and retired from office in the Wellington ministry in 1828 with others of the Canning party. He had already made a reputation for his command of foreign policy, and in 1830 he was made Foreign Secretary in the Whig ministry of Earl Grey. From this time he continued to be a member and leader of the Liberal party. In 1831 he was returned for Bletchingley, and after the Reform Bill (1832) for South Hants. He retired from office in Dec., 1834, but in April, 1835, he resumed his former appointment under Lord Melbourne. He continued in office as Foreign Secretary until 1841. It was during this period that he gained his great reputation for vigilance and energy in the conduct of foreign affairs. In 1845 he supported the repeal of the corn-laws, and in 1846 he was Foreign Secretary in the Russell ministry. Several causes of dissatisfaction, the chief being his recognition of Louis Napoleon without consulting his colleagues, led to Palmerston's resignation in Dec., 1851. In Feb., 1852, he became Home Secretary in the coalition ministry of Lord Aberdeen. On the resignation of this ministry he became Prime Minister in 1855, remaining so, with a brief interruption, for the remainder of his life. He was made D.C.L. of Oxford in 1862, and elected Rector of Glasgow University in 1863. —BIBLIOGRAPHY: Walter Bagehot, *Biographical Studies*; L. C. Sanders, *Life of Viscount Palmerston*; Sir E. Ashley, *Life and Correspondence of Henry John Temple, Viscount Palmerston.*

Palmerston, the chief settlement in the Northern Territory of South Australia, on Port Darwin, accessible to ocean-going steamers of the largest draught. Pop. 600.

Palmet'to Palm, a common name of several palms, especially of the *Sabal Palmetto*, the cabbage-palm, which grows in the West Indies and in the southern states of North America. It attains the height of 40 or 50 feet, and is crowned with a tuft of large leaves. It produces useful timber, and the leaves are made into hats, mats, &c.

Palmistry is the popular name for the art, or according to its professors the science, of chiromancy (Gr. *cheir*, the hand, *manteia*, divination), by which it is claimed that not only the character of a person, but also the events, both past and future, of his life, may be discovered on examination of the palm of the hand. The practice of palmistry is of considerable antiquity. It was known to the ancient Greeks, and is alluded to by Pliny and Aristotle; was in vogue to some extent among the Romans; and has been employed in India since a remote period, chiefly by a special caste of Brahmins known as the Joshi, who, though still pursuing the calling, show little of the skill displayed by their ancestors. Palmistry was widely prevalent during the Middle Ages, a leading work of that period on the subject being Johann Hartlieb's *Die Kunst Ciromantia* (Augsburg, 1475). A famous palmist of more recent times was the well-known Frenchwoman Marie Anne Lenormand, who was in great request by the Parisian fashionable world of her day (1772–1843), and was frequently consulted by the leading ladies of Napoleon's court. Authorities of the nineteenth century were the French writers D'Arpentigny and Desbarrolles, who published respectively *La Chirognomie* (Paris, 1843) and *Les Mystères de la* *main* (1859). D'Arpentigny deals chiefly with chirognomy, an allied art which confines its study to the general form of the hand and fingers. The palmist proper confines his attention rather to the 'mounts' of the hand, those elevations, namely, which occur at the bases of the fingers and thumb, and also on that portion of the hand extending from the base of the fourth finger to the wrist; to the 'lines' with which the palm itself is freely marked; and to the 'bracelets' seen upon the wrists. The mounts are seven in number, one upon the base of every finger, with two others on the palm. They are named after the planets. Marked development of the mount of Venus at the base of the thumb implies a loving character; on the first finger (Jupiter), ambition and pride; the second (Saturn), fatality; the third (Apollo), art or riches; the fourth (Mercury), science or wit; while the two on the palm itself are those of Mars, denoting courage or cruelty, and of the Moon, implying folly or imagination. Of the lines, that of 'life', if long, will promise length of days; it lies around the base of the thumb. Crossing the palm somewhat diagonally is the line of 'head', which should be clearly marked and long. That of 'heart', parallel with it but nearer the finger-bases, denotes a loving and devoted character. Other lines, not found in every hand, are all supposed to possess a special signification. The bracelets or *racette*, on the wrists add value to the 'line of life'. It is perhaps hardly necessary to remark that little faith is to be placed in palmistry, the lines and other marks on which such stress is laid being merely physical characteristics, due largely to the particular formation of the hand, the size of the bones, &c.; also, to no small extent, to the special development of some muscles more than others by the work to which the hand is put. This scientific fact, however, does not prevent the practice of palmistry at the present day, the fashionable West-End professor continuing to receive her guineas, while the gipsy wheedles sixpence from the cottage girl. Palmistry, practised for gain and with intent to deceive, is a punishable offence. Modern works dealing with the subject include: Oxenford's *Modern Palmistry* (1900); Frith and Allen's *Chiromancy* (1901); Phanos's *Hand-reading* (1903); and Stephenson's *Practical Palmistry* (1904).



The Palm of the Hand, showing the Chief Lines

Palmit'ic Acid, ($C_{16}H_{32}O_2$), a fatty acid occurring in many fats, whether of the animal or vegetable kingdom, such as palm-oil, butter, tallow, lard, &c., and existing partly in a free state but generally in combination with glycerine as the glyceride *palmitin*. It is a colourless, crystalline substance, which melts at 62·6° C. The sodium salt of the acid is a soap (q.v.).

Palm-kale, a variety of the cabbage extensively cultivated in the Channel Islands. It grows to the height of 10 or 12 feet, and has much the aspect of a palm.

Palm-nut Cake, an artificial feeding-stuff produced from the kernel of the palm-nut (*Elæis guineensis*) after the extraction of the oil.

Palm-oil is the product of the oil palm (*Elæis guineensis*) indigenous to West Africa. This palm grows to a height of 30 feet, and is surmounted by a feathered group of 15-feet leaves. The industry maintained by the products of the oil palm is one of the most important in Nigeria (West Africa), where the tree grows wild and where the product forms the staple export. Palm-oil is obtained from the large, oval-headed, red-coloured fruits by boiling in water the fleshy pulp which surrounds them, and skimming the orange-coloured fat from the surface. The fat has then the appearance of butter-fat, and is used largely in Europe in the preparation of soap and candles. The kernels themselves are pressed for oil, which is utilized for lubricants and margarine.

Hitherto the industry has been dependent upon the wild oil palms of West Africa for supply, but the trees have successfully been raised in plantations in parts of Malaya and in Sumatra, and the oil palm may be a potential source of wealth as a plantation crop in the Eastern tropics, and may become more of an economic proposition as regards yield than even the indigenous palms of Nigeria. Palm-wine, a cheap fermented liquor of doubtful quality, is distilled by the natives of Nigeria to replace the cheap spirits whose importation has been prohibited.

Palms, the Palmaceæ, a natural order of arborescent monocotyledons, chiefly inhabiting the tropics, distinguished by their fleshy, colourless, six-parted flowers, enclosed within spathes; their minute embryo lying in the midst of albumen, and remote from the hilum; and their large rigid, plaited or pinnated leaves. The palms are among the most interesting plants in the vegetable kingdom, from their beauty, variety, and associations, as well as from their great value to mankind. While some, as *Kunthia montăna*, *Oreodoxa frigida*, have trunks as slender as the reed, or about as long as a ship's cable (*Calămus rudentum* being 500 feet), others, as *Jubœa spectabilis* and *Cocos butyracea*, have stems 3 feet and even 5 feet thick; while some are of low growth, as *Attalēa amygdalina*, others exhibit a stem towering from 160 to 190 feet high, as *Ceroxylon andicŏla* or wax-palm of South America. Also, while they generally have a cylindrical undivided stem, *Hyphæne thebaica* (the doum palm of Upper Egypt) and *Hyphæne coriacea* are remarkable for their repeatedly divided trunk. About 1100 species are known, but it is probable that many are still undescribed. Wine, oil, wax, flour, sugar, sago, &c., are the produce of palms; to which may be added thread, utensils, weapons, and materials for building houses, boats, &c. There is scarcely a single species in which some useful property is not found. The coco-nut, the date, and others are valued for their fruit; the cabbage-palm for its edible terminal buds; the fan-palm and many more are valued for their foliage, whose hardness and durability render it an excellent material for thatching; the sweet juice of the Palmyra and others, when fermented, yields wine; the centre of the sago-palm abounds in nutritive starch; the trunk of the wax-palm exudes a valuable wax; oil is expressed in abundance from the oil-palm; many of the species contain so hard a kind of fibrous matter that it is used instead of needles, or so tough that it is manufactured into cordage; and, finally, their trunks are in some cases valued for their strength, and used as timber, or for their elasticity or flexibility. There is only one European species, the *Chamærops humilis*. See *Areca*; *Betel-nut*; *Cabbage-palm*; *Coco-nut*; *Date*; *Doum Palm*; *Fan-palm*; *Palm-oil*; *Palmyra Palm*; &c.

Palm Sunday, the last Sunday before Easter, on which Christ's entry into Jerusalem, when palm branches were strewed before him, is celebrated. Palm Sunday, also called *Pascha Floridum* and Flower Sunday, is still celebrated with much solemnity by the Roman Catholics; branches are strewed in the churches, and a procession takes place. Formerly a wooden ass, with the figure of Christ on it, was drawn on rollers in procession. The state of Florida, discovered on Palm Sunday, 1512, received its name from this day.

Palmy'ra (Heb. *Tadmor*, City of Palms), an ancient city of Syria, now in ruins, situated in an oasis 140 miles E.N.E. of Damascus. Founded or enlarged by Solomon in the tenth century B.C., it was an entrepôt for the trade between Damascus and the Mediterranean, and during the wars between the Romans and the Parthians it acquired great importance. It became the faithful ally of Rome, and during the reign of Gallienus (260–268) Odenathus, the ruler of Palmyra, established an independent Palmyrene kingdom. Odenathus was succeeded by his widow Zenobia, to whom Palmyra chiefly owes its fame, and who took the title of Queen of the East. She was besieged in Palmyra by Aurelian, and compelled to surrender. On his departure the inhabitants revolted, on which Aurelian returned and destroyed the city (A.D. 273). He permitted the inhabitants to rebuild it, but it never recovered its importance. In 1400 Tamerlane completely destroyed it. There are remains of ancient buildings, chiefly of the Corinthian order, with the exception of the Temple of the Sun, which is Ionic.—Cf. Wood-Dawkins, *Ruins of Palmyra and Baalbeck*.

Palmy'ra Palm (*Borassus flabelliformis*), the common Indian palm, a tree ranging from the north-eastern parts of Arabia through India to the Bay of Bengal. In India and other parts of Asia it forms the chief support of 6,000,000 or 7,000,000 of population. Its fruit is a valuable food, its timber is excellent, and it furnishes thatch, cordage, and material for hats, fans, umbrellas, &c. It produces sugar and arrack, and its leaves are used for writing-tablets. The young shoots are boiled and eaten, the seeds are edible, and the fruit yields a useful oil. A full-grown palmyra is from 60 to 70 feet high, and its leaves are very large. The name palmyra-wood is frequently given to other woods of a similar nature.

Palo'lo, or Palolo Worm, a marine annelid (*P. viridis*) found in great abundance near the coral reefs in the South Sea Islands. They are taken in large numbers in nets by the islanders, who esteem them, alive or roasted, as a great delicacy.

Palpi, or Palps, jointed processes, held to be organs of touch, attached in pairs to the labium and maxilla of insects, and termed respectively *labial* and *maxillary palpi* or feelers. (See figure at *Entomology*.) Palpi are also present on the mouth appendages of other arthopods.

Palpitation is the term used to signify that a person is conscious of the beating of the heart. There is usually associated with this an increase in the heart rate, which may be very rapid, causing restlessness and discomfort. During an attack the skin may be flushed or pale, and is often unduly moist, while severe attacks give rise to pain and tenderness over the heart. The condition may be quite independent of any organic disease, and arise as the result of emotion of various sorts in highly strung people. It is an outstanding feature in the so-called 'soldier's heart', or it may be a symptom of definite heart disease, when it is brought on by effort affecting the heart.

Paludan-Müller, Frederik, Danish poet, born in 1809, died in 1876. Educated at Copenhagen University, he began his career as a poet in 1832. His works include: *Adam Homo*, a humorous didactic poem; *Kalanus*, an Indian tragedy; *Adonis*, a poetic romance; *Amor and Psyche*, a lyrical drama; &c.

Pamiers (pā-mi-ā), a city of Southern France, capital of an arrondissement, in the department of Ariège. It has a seventeenth-century cathedral, and manufactures woollens, paper, bricks, and flour. Roger II, comte de Foix, built a castle in the twelfth century, around which the town grew up. Pop. 10,000.

Pamir, or **Pamirs** (the 'Roof of the World'), an elevated mountain region of Central Asia, regarded as formed by the meeting of the Himálaya and Thian Shan mountain systems. It consists of plateaus having a general elevation of more than 13,000 feet, dominated by still loftier ridges and summits clothed with eternal snow. There are several small lakes here, and the sources of the Oxus take their rise in the Pamir. The atmosphere is exceedingly dry, the extremes of heat and cold are very great, and great part of the surface is barren. The Kirghiz, however, find a certain amount of pasture for their cattle in summer, and in favoured localities there is a little cultivation.

Pam'lico Sound, a shallow lagoon of the United States, on the south-east coast of North Carolina. It is 80 miles long, from 8 to 30 miles wide, and separated from the ocean by long, narrow, sandy islands.

Pampas (Peru. *bamba* or *pampa*, a steppe), a name given to the vast treeless plains of Latin America. Shallow lakes or swamps occur in some parts, and the pampas have sometimes the character of a salt steppe. Enormous quantities of wheat are raised, and cattle are widely reared on the pampas.

Pampas-grass (*Gynerium argentĕum*), a grass which grows in the pampas in the southern parts of South America. It has been introduced into Europe as an ornamental plant. It has panicles of silvery flowers on stalks more than 10 feet high, and its leaves are from 6 to 8 feet long. The male and female flowers are on separate stalks.

Pampe'ro, a violent wind from the west or south-west which sweeps over the pampas of Argentina and Uruguay.

Pamphlet, a term applied to an ephemeral publication of comparatively small size, occasional and not periodical, commonly discussing some questions of public or special interest at the time. Pamphlets are now to a great extent superseded by the opportunities of discussion afforded by regular periodical literature, though they still serve many important uses. Among celebrated pamphlets of former times may be cited Milton's *Areopagitica* (1644), in favour of unlicensed printing; Saxby's *Killing no Murder* (1657), aimed at Cromwell; Defoe's *Shortest Way with the Dissenters* (1703); and Paine's *Common Sense* (1776). The greatest and one of the most prolific pamphleteers is Swift.

Pamphyl'ia, an ancient province of Asia Minor, extending along the Mediterranean from Cilicia on the east to Lycia on the west. It was inhabited by a mixed race, partly Greek and partly Semitic. Pamphylia never attained any political importance. It was subject successively to Persia, Macedonia, and Syria, to the Pergamene dominions, and eventually (133 B.C.) to Rome, although some Greek colonies for a time maintained their independence.

Pamplo'na (ancient **Pompelo** or **Pompelopolis**), a city of Spain, and capital of the province of Navarre or Pamplona, and of the ancient kingdom of Navarre, on the Arga, a tributary of the Aragon. The town has a cathedral, founded in 1100 and rebuilt in 1397, and a bull-ring capable of seating 8000 persons. It was built by Pompey in 68 B.C., and was once known as Pampeluna. The Plaza de Castillo is one of the finest squares in Spain. Pop. 30,885.

Pan, from a Statue in the British Museum

Pan, a rural divinity of ancient Greece, the god of shepherds, represented as old, with two horns, pointed ears, a goat's beard, goat's tail, and goat's feet. The worship of Pan originally existed in Arcadia, and was first introduced into Athens after the battle of Marathon, in which it was asserted that he had assisted the Athenians. His festivals were called by the Greeks *Lycæa*, and were known at Rome as the *Lupercalia*. This shepherd god was afterwards regarded by some philosophers, especially the Stoics, as the All-supporting God of nature, and personified the universe (Gr. *To Pan*, The All). Pan invented the syrinx or *pandean* pipes. From him comes the expression *panic fear*, because he was believed to cause sudden and often inexplicable terror.

Panamá, capital of the Republic of Panamá, on the Gulf of Panamá and on the Pacific coast of the Isthmus of Panamá. The city lies on a tongue of land, across which its streets stretch from sea to sea. Panamá is chiefly important as the Pacific terminus of the interoceanic railway and also of the Panamá Canal. The railway, which has been in operation since 1855, runs across the isthmus from Panamá to Colon (Aspinwall) on the Atlantic. Pop. 61,870.

Panamá, a republic of Central America, co-extensive with the Isthmus of Panamá, bounded northwards by the Caribbean, and on the south by the Pacific Ocean. The eastern and western frontiers merge respectively with the Republics of Colombia and Costa Rica. The republic has an extreme length of about 480 miles; breadth between 30 and 120 miles; and a total area of 32,880 sq. miles. The pop. (1920) was 401,428.

Physiography: Orography.—Panamá is generally mountainous. In the east it is traversed by the Serrania del Darien, an Andean range, partly in Colombia; in the west there are two ranges, the Sierra de Chiriqui and a part of the Cordillera of Talamanca, which extends over the Costa Rican frontier. Upon these latter ranges rise a series of volcanoes, attaining in the Chiriqui volcano an altitude of 9275 feet. The mountains are in places broken by low passes, averaging 300 feet above sea-level. *Rivers and Lakes.*—None of the 480 rivers of Panamá are navigable, and, although some are of considerable length, they are all torrential in the wet season. The principal one is the Chagres, rising near the Pacific and flowing first south-west and then north to the Caribbean. A ten-mile strip of territory running from the Caribbean to the Pacific is traversed by the Panamá Canal (q.v.), and is completely under the authority of the United States, who purchased their rights for 10,000,000 dollars, and pay an additional 250,000 dollars yearly. There are two artificial lakes, Gatun and Sosa (Miraflores), both in the Canal Zone. *Climate.*—The climate is tropical, and the Caribbean coast is slightly warmer than on the Pacific side. At Panamá the mean temperature is 80·6° F., but that of the republic generally is only 79·1° F. Between January and the end of March is the dry season, when a north-easterly wind prevails; the wet season lasts from April to December.

Social Conditions: People.—The Panamánians are of mixed Spanish, Indian, and negro extraction, and, like all mongrels, they have few redeeming qualities. There are some temporary immigrant Yankees and Europeans, with about 3000 Chinese and over 50,000 British West Indian subjects. *Religion.*—Roman Catholicism predominates, excepting in the Canal Zone, which is overwhelmingly Protestant. *Education.*—Nominally education is free and compulsory between the ages of seven and fifteen years, and a university has been constructed (at Panamá). Many young people of both sexes are trained in Europe and the United States at the expense of the State. *Defence.*—There is neither army nor navy, but a police contingent of 69 officers and 750 men is maintained. *Money.*—The gold *balboa* (B/) of 1·672 grammes, ·900 fine, is legally equivalent to the United States gold dollar, and is the monetary unit. Silver coins are the *peso* (25 grammes, ·900 fine), and $\frac{1}{2}$, $\frac{1}{5}$, $\frac{1}{10}$, and $\frac{1}{20}$ *peso* pieces, and nickel coins of $2\frac{1}{2}$ cents. There is no paper money. Two silver pesos are equal to one United States gold dollar, and United States money is in most general use. *Weights and Measures.*—Both English and metric systems are used.

Transport and Communication: Railways.—The Colón-Panamá Railway (48 miles) operates through the Canal Zone Territory. It is the property of the Panamá Railroad Company, which is in turn owned by the United States. The only other railways are (1) those operated by the United Fruit Company on their banana plantations in Bocas del Toro, and (2) a narrow-guage line between Pedregal and Boquete (province of Chiriqui), with branches from David to La Concepcion and from Dolega to Potrerillos. A concession for a railway between Colón and Almirante is in the possession of two Americans, and one is also projected from Almirante to join the Chiriqui Railway. *Shipping.*—This is dependent entirely upon the Panamá Canal. *Roads.*—These are under construction. *Telegraphs.*—Wireless communications are maintained by the Canal Zone radio stations. Submarine cables run between Jamaica and Panamá, from Colón to the United States and Europe, and from Panamá to North and South American ports. The Jamaica-Panamá route is British; the others belong to the 'All America Cables'. There is also an extensive inland telegraphy system of thirty-seven offices.

Production.—Bananas are the staple export, and all trade in this commodity is in the hands of the United Fruit Company. The trade has suffered much, as in Jamaica, from uncontrollable outbreaks of Panamá disease. Coco-nuts, copaiba, sarsaparilla, ipecachuanha, and mahogany are also important. Coffee is produced near the Costa Rican frontier, in the province of Chiriqui, and much caoutchouc is collected wild from the Cordilleras, or is cultivated on the coasts. On the Atlantic side (province of Cocté) there is a large co-operative agricultural undertaking which produces coca, coffee, and caoutchouc. Sugar and tobacco are also grown; cattle, horses, pigs, mules, and goats are raised; and hides form a valuable item in the Panamánian export list. There is much land available and suitable for settlement by immigrants. Pearl-fishing is practised off Coiba Island, and off the Perlas (q.v.) in the Gulf of Panamá. Nearly every common mineral exists excepting coal, but none of the deposits have hitherto been worked.

Divisions.—For administrative purposes Panamá is divided into eight provinces, which with their capitals are as follows:

Bocas del Toro (Bocas del Toro).
Cocté (Penonomé).
Chiriqui (David).
Panamá (Panamá).
Los Santos (Los Tablas).
Colón (Colón).
Herrera (Chitré).
Veraguas (Santiago).

The capital city is Panamá, on the Pacific. Colón is on the Atlantic coast. Smaller ports are: (Atlantic) Bocas del Toro, Portobello, Mandinga (opened Sept., 1916); (Pacific) Aguadulce, Pedregal, Montijo, and Puerto Mutis.

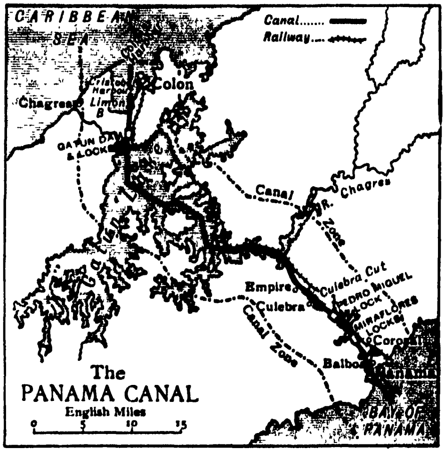
Government.—The executive is in the hands of a President, elected by direct vote for four years and not eligible for re-election. A Chamber of Deputies of 33 members (1 Deputy per 10,000 electors) is elected every four years, and meets biennially on 1st Sept. There are also 3 Vice-Presidents and a Cabinet of 5 ministers. Each of the eight provinces is under a Governor.

History.—Panamá was formerly a department of the Republic of Colombia, and asserted its independence on 4th Dec., 1903, being recognized shortly afterwards by the United States and by other Powers. On 6th April, 1914, the United States and Colombia completed a treaty at Bogotá whereby the latter agreed to recognize Panamánian independence in return for the sum of 25,000,000 dollars and certain rights in the Canal Zone, but this agreement (Treaty of Bogotá) was not ratified by the United States Senate until 20th April, 1921. It was ratified by the Colombian Congress on 24th Dec., 1921. A frontier dispute with Costa Rica was submitted to United States arbitration, who pronounced against Panamá, and the Costa Ricans have now occupied (since Sept., 1921) the disputed region, although their possession is not officially recognized by Panamá.

Bibliography: Constantine Graham, *Report on the Economic and Commercial Situation in Panamá* (H.M. Stationery Office); H. A. Franck, *Things as they are in Panamá*; J. Streitberg, *La République de Panamá.*

Panamá, Isthmus of, formerly called the **Isthmus of Darien,** has a breadth of from 30 to 70 miles, connects North with South America, and separates the Pacific from the Atlantic. The coast is rocky and lofty along the Caribbean Sea, but low and swampy along the Pacific. From the heights of the isthmus Balboa was the first European to see the Pacific Ocean.

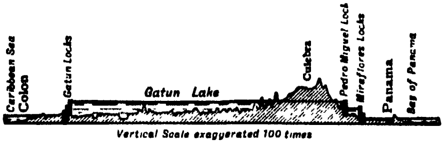
Panamá Canal. Almost from the time of the discovery of the two Americas the advantages of a water-way between them have been apparent. Columbus, indeed, believed an opening to exist; and on a globe made by John Schoner in 1520, preserved in the town library of Nürnberg, a cutting across the Isthmus of Darien is shown.



Spanish geographers and sailors urged the making of a canal, but all such ideas were discouraged by Philip II. In the eighteenth century plans were completed by the Dutch, but were never put into actual operation.

It was not until 1880 that the French, fired by the success of the Suez Canal, decided to finance de Lesseps in a similar undertaking in Panamá. Lesseps estimated that the scheme would cost £24,000,000 and could be completed in eight years. But his calculations were made from insufficient data and without regard to climate and other conditions. From the first his workmen suffered cruelly from fever and disease, which were attributed, wrongly enough, to the clouds continually hanging over the Cordilleras. Also, the phenomenally rapid rise of the River Chagres in the rainy season was not allowed for. In itself the design of Lesseps for a sea-level canal is not unsound, and the work done by his labourers was all good; but to cut a canal through a ridge of the Cordilleras (there only 500 feet high) and to cope with the waters of the Chagres and other mountain streams was a colossal enterprise.

Too late, Lesseps changed his plans, and began making locks to lessen the amount of excavation. Unfortunately the financial side of the scheme had been grossly mismanaged, and between neglect and dishonesty large sums had melted away. In 1889 the Company was obliged to go into liquidation, having spent £66,000,000 since the time of its inception. From being a national hero, Lesseps became an object of execration, for thousands of small families had entrusted him with their savings.



Section through the Panamá Canal

A new Panamá Company was formed upon the failure of the old one, and continued the work of excavation for another eight years, and in 1904 the United States Government stepped in and took over the whole responsibility. From that time onwards the history of the canal is the history of a struggle between nature and science. Instead of taking armies of work-people to Panamá to die, the United States sent them there to live healthily. Under the leadership of Major Ronald Ross and General Gorgas, an organized attack upon the disease-carriers of the district—the mosquitoes—was begun. Every ditch and pool which might harbour mosquitoes was treated with oil, and special houses having doors and windows covered with copper-wire gauze were put up wherever houses were needed. Every possible precaution was taken to safeguard the health of the workmen and their families, the result being that Panamá is now one of the healthiest places in the world.

The work did not, however, proceed without interruption. Although a certain amount of excavation had been done, a vast amount remained undone, for modern vessels require deep draught and plenty of room for manœuvring. The total length of the canal is a little over 50 miles, and its minimum depth 41 feet. The position which has given most trouble is that known as the Culebra Cut, a stretch of 9 miles through the ridge. Here the excavators were continually hindered by landslides, the soil being of a soft, sticky nature, so that it slipped in great layers. At one time it was said that a million cubic yards of earth were in motion. Eventually the sides of the cut will find their own angle of repose, and the slides, in any serious proportions, will come to an end.

At each end of the canal, at Gatun and Miraflores, are locks for raising ships to the high level. These locks are so big as to form one of the greatest engineering triumphs of the world. At Gatun it was necessary to build an enormous dam. The effect of this dam has been to turn the Chagres Valley into a great lake, where the Chagres and other streams can rise or fall as rapidly as they please without doing any damage. This dam, made very largely of material excavated from the Culebra Cut, is the largest ever attempted, being 8¼ miles long. Its width at sea-level is 1900 feet, the reason for such extraordinary solidity being found in the fact that many engineers refused to believe that a dam at Gatun could be built with safety.

The canal, though not entirely finished, was opened for traffic on 14th Aug., 1914. Obviously the moment was an anxious one for those interested in the railways of the continents. Railway rates are necessarily greatly in advance of canal rates, and in the case of the American trans-continental railways haulage is particularly costly on account of the great chains of mountains which they have to traverse. In practice it has been found cheaper to send goods from New York to the west coast by sea and canal than by rail over the Rocky Mountains. But the length of time occupied by the water route precludes the possibility of the railway being superseded for many kinds of traffic. The fact that the opening years of the canal's existence were spent under conditions of war has prevented the formation of really instructive and significant statistics; moreover, the aforesaid 'angles of repose' in the banks of the Culebra Cut not having been reached, stoppages to traffic have occurred several times by reason of the landslides.

In spite of these circumstances, however, the canal has proved itself an important factor in the world's trade. Japan, naturally, has been in the forefront of the foreign nations making use of it, while cargoes from the East Indies, notably rubber, are accounting for more and more of the tonnage passing through.

On 18th Nov., 1903, a treaty between the United States and Panamá was signed which provided facilities for the construction and maintenance of the canal, and granted to the United States in perpetuity the use of a zone (Canal Zone) of 5 miles in width on either side of the canal, within which the United States exercises sovereign rights. The cities of Panamá and Colón are outwith the agreement. The area of the zone is 441 sq. miles. Pop. (1921), 23,757.

Panathenæ'a, festivals celebrated at Athens in honour of Athena, tutelary deity of the city. The festivals were of two kinds: the *great Panathenæa*, held every fifth year, and the *lesser Panathenæa*, observed annually. They consisted of athletic and musical contests, followed by sacrifices and feasts. After the *great Panathenæa* there was a solemn procession, in which the *peplos*, a sacred woollen garment woven by young virgins, was carried and placed on the statue of the goddess. The festival was so holy that criminals were released from the prisons on the occasion of its celebration.

Panay, an island of the Philippines, the westernmost of the Visayan group, between Mindoro and Negros. It is of triangular form, about 100 miles broad and 100 miles long. It ranks fifth in size among the Philippine islands, is mountainous but very fertile, yielding much sugar, tobacco, &c. The chief occupation of the inhabitants is agriculture, and staple products are sugar, rice, and copra. Capital, Iloilo. Pop. about 770,000.

Panchatantra (Skt. *Five Books*), a famous collection of Indian stories and apologues attributed to Vishnu-Sarma, better known as Pilpai or Bidpai. The original Sanskrit, of ancient but uncertain date, consists of five books which form so many sections, each preceded by a preface. It is one of the Indian books of knowledge, and was written by a Brahman for the edification and instruction of the three sons of a King of Dekkan. The *Panchatantra* was translated into Pehlevi in the sixth century A.D. under the title *Kalilah and Dimnah,* into Hebrew by Rabbi Joel, and into Latin in 1262. The narratives are throughout interspersed with sentences, extracts from legal codes, maxims, thoughts, &c. The *Panchatantra* is one of the sources of the *Hitopadesa* (q.v.).

Pancras, the patron saint of children, traditionally reputed to have been a native of Synnada, in Phrygia. He was at Rome during the persecutions of Diocletian, refused to give up Christianity, and was beheaded at the age of fourteen years. In art he is represented with a palm in one hand and a sword in the other.

Pan'creas, the sweet-bread of animals; one of the viscera of the abdomen. In man it lies behind the stomach in front of the first and second lumbar vertebræ. The pancreas is an oblong gland about 8 inches long, 1½ inches broad, and from ½ to 1 inch thick. Its right extremity, called the *head,* lies in a bend of the duodenum. The *tail* or left extremity extends to the spleen. The structure of the pancreas is similar to that of the salivary glands. It is composed of lobules throughout. The secretion of this gland is conveyed to the intestine by the *pancreatic duct.* This duct runs from right to left, and is of the size of a quill at its intestinal end. The *pancreatic juice* is a clear, ropy fluid. The functions of the pancreatic juice in digestion are devoted to the conversion of starchy elements into sugar and to the assimilation of fatty matters. It also acts upon proteid matters.

Pancsova (pȧn'cho-vȧ), a town of Yugo-Slavia, formerly belonging to Hungary, in the Banȧt. It is situated at the confluence of the Temes with the Danube. It manufactures liqueurs, brick, and silk. Pop. 20,000.

Panda, or Wah (*Ailurus fulgens*), a mammal constituting a special family allied to the bears, found in the woody parts of the mountains of Northern India, about equal to a large cat in size. It is chestnut-brown in colour, and dwells chiefly in trees, feeding mostly on vegetable food, but also devouring insects and eggs.

Panda (*Ailurus fulgens*)

Pandana'ceæ, the Screw-pine family of plants, monocotyledonous trees or shrubs, with flowers unisexual or polygamous; perianth wanting, or consisting only of a few scales. The fruit is either in parcels of fibrous drupes or in berries. The leaves are long, imbricated, and amplexicaul. Aerial roots are a feature of many. They are tropical plants, and furnish edible and other useful products. The typical genus is Pandănus. See *Screw-pine.*

Pandects, a collection of laws, systematically arranged, from the works of Roman writers on jurisprudence, to which the Emperor Justinian gave the force of law, A.D. 533. The collection is also known as the *Digest*. The Justinian Code had been previously compiled by the order of the emperor, and the *Digest*, or *Pandects*, were designed to supplement it. The *Pandects* are divided into fifty books.

Pando'ra, in Greek mythology, the first woman on earth, made from clay by Hephæstus, and sent by Zeus to mankind in vengeance for Prometheus's theft of heavenly fire. Each of the gods gave her some gift fatal to man. According to later accounts, the gods gave her a box full of blessings for mankind, but on her opening the box they all flew away, except hope. Epimetheus, brother of Prometheus, married her.

Pangani, a maritime district of Tanganyika Territory, East Africa, comprising a low coastal belt which rises to western highlands, and is traversed by the Pangani River in the north, which forms a part of the boundaries with Wilhelmstal and Tanga. A branch of the Tanga railway line extends to Handeni. Pangani, the capital, is a coast town at the mouth of the Pangani River, and has a large trade. Pangani district was occupied by the British in Aug., 1916.

Pan-Germanism (Ger. *All-Deutschtum*), a German political movement which, from a psychological point of view, is the idea of German unity carried to its logical conclusion. Like Pan-Slavism, it is the expression of national pride, the aim of the Teutonic race, believing in its own supremacy over others, to unite the scattered members into one powerful organization, political, social, and economic. The foundations of Pan-Germanism were laid in 1813, when German nationalism was being fostered during the struggle against Napoleon, and the poets Arndt and Koerner sang of German unity and of a greater Germany. Metternich, who had only the prosperity of Austria at heart, was afraid of allowing the sentiment of nationalism to develop in the then loose confederation of German states, and for a time he succeeded in crushing it. When, however, Austria's splendour came to an end on the battlefield of Sadowa, and Prussia's power increased, and especially after the foundation of the new German Empire in 1871, the idea of Pan-Germanism developed more rapidly.

The Pan-German Union (*All-Deutscher Verband*) was established in 1891, and under the hegemony of Prussia an endeavour was made not only to extend German rule over the German-speaking populations in Austria, the Baltic provinces, Switzerland, and Bohemia, but also to propagate German racial solidarity in Scandinavia and Holland, and to carry German culture to Africa and Brazil. A policy of naval and colonial expansion was preached, emigration of Germans was encouraged, and German literature was systematically spread. The Revolution of 1918 has not abated the zeal of the Pan-Germans.

Pan'golin, the name applied to the Scaly Ant-eaters (Manidæ), forming a family of the Edentate order of mammals. They occur in Southern Asia and Africa; have the body invested by a covering of imbricated scales of horny material; vary from 3 to 4 feet in length; and defend themselves by assuming the form of a ball. The tail is long, and the feet are provided with strong curved claws, which assist the animals in burrowing. The jaws are destitute of teeth, and the tongue is of great length. The food consists of insects. The four-toed pangolin (*Manis tetradactyla*) inhabits Western Africa.

Pangolin or Manis

Panicle, a form of inflorescence differing from a raceme in having a branched instead of a simple axis. See *Inflorescence*.

Pan-Islamism, an Ottoman political ideal having as its basis the reunion of the scattered religious sects and political divisions of Islam under one head, for the resistance of further encroachment on Mahommedan territories by European powers, and for the ousting of European rulers from Asia and Africa. This ideal finds expression in Arabic by a phrase *Ittihad al-Islam*, meaning 'Islamic Union' or Pan-

Islamism, and was first mentioned in English in *The Times* of 19th Jan., 1882. The Ottoman interpretation of the movement was simply a confederation of Muslim peoples on German lines and under Turkish hegemony, but was represented in the religious light as 'a unification of the Islamic Empire under the spiritual power of the Sultan, as Caliph'. In support of this policy the theory that there could be only one legitimate successor to the Prophet was widely canvassed, and it was emphasized that, while on the disruption of the Islamic Empire the area of religious influence still continued to expand, so also did the political subdivisions continue to multiply. Dissension was the true cause of Islamic weakness, but given solidarity, the consolidation of widely scattered sects and peoples under Ottoman hegemony, Islam might once again become politically formidable. The Sultan Selim I (A.D. 1512–20) by his conquests (notably of Egypt) was successful in a partial enforcement of Pan-Islamic ideals, and Abdul Hamid II made use of the movement politically to preserve the integrity of his dominions, and to secure freedom from European interference in purely internal matters, by representing himself and his nation, then the strongest Islamic power, as the natural champions of weak and oppressed Muslims throughout the world. By this move he became a formidable enemy, and was much applauded by Germany, who had few Mahommedan subjects by comparison with Great Britain or France, and who naturally regarded the policy of Abdul Hamid as working out indirectly the salvation of Prussian as opposed to foreign interests in the Near East.

Panicle of Common Oat

In 1903 a Pan-Islamic Society was established in London, and by 1911 (Salonika Congress) the Young Turk Committee of Union and Progress had repudiated their policy of 1909, and were canvassing all Muslim states under European control on behalf of the Pan-Islamic doctrine, urging all good Mahommedans to acknowledge the Sultan of Turkey as their legitimate sovereign, and emphasizing the Oriental fact, 'religion first, nationality last'. Sectarian difficulties beset the reformers. Turkey had always maintained the questionable right to interfere in Persian affairs, 'for Persia is a Muslim state'. The great majority of Persians are of the Shiite sect of Mahommedanism, and are violently opposed to the Sunnite, or Ottoman creed. These sects are the most powerful in Islam, but the Shiite is the weaker of the two, and the Persian was urged by the Young Turk propagandist to 'remember he was a Muslim and to forget he was a Shiite'. Under a similar scheme the smaller sects of Islam (Isma'ilis, Zeidis, &c.), which rendered any scheme of unification impracticable, were to be wiped out and their adherents incorporated with the great bulk of Muslims.

With the advent of the European War affairs moved rapidly. Turkey subordinated her foreign policy to that of a European power (Germany) and went to war, proclaiming a *jihad* that nobody would either countenance or join. The Keeper of the Holy Places, the Sherif of Mecca, entered on the British side in 1916, and in so doing he damned for ever the Turkish cause in the eyes of the already disgusted and Turk-ridden Arabs. At the end of the war the formation of the Kingdom of the Hejaz, the disruption of Turkey in Europe, the occupation of Constantinople by foreign troops, and the general shrinking of Turkish power, extent, and prestige have given Pan-Islamism a blow from which in all probability it will never sufficiently recover to resume its place as a powerful, formidable problem in European politics.—BIBLIOGRAPHY: *Foreign Office Handbook No. 57*; G. Wyman-Bury, *Pan-Islam v. Arabia Infelix*. The subject is followed in the Cairene monthly, *Al-Manar*, published in Arabic, from 1899 onwards, and also in the *Revue du Monde Musulman* (1911–9).

Panno'nia, a province of the ancient Roman Empire, between the Danube and the Alps, and thus comprising Hungary, Yugo-Slavia, and present Austria. The Pannonians, an Illyrian race, were finally subdued by Tiberius, A.D. 8, and Pannonia became a Roman province. It had numerous towns, of which Vindobona (Vienna) was the chief.

Pan-Slavism, a name given to the efforts of the Slavonic races in Europe to promote union and co-operation. The efforts comprise a literary, a sentimental, and a political movement. Patriotism and idealism gave birth to the movement, and it was strengthened by the feeling of the weaker nationalities that union was necessary. The Pan-Slavonic idea has existed for centuries, but it took shape only in the nineteenth century, fostered by Russia's defeat of Napoleon, and receiving a stimulus from the nationalistic tendencies of the century. The poet Kollar summed up Pan-Slavism as follows: " The head of the dear goddess Slava (Glory) is Russia, the Czechs constitute her arms and hands, the Serbs are her two feet, whilst the other Slavonic populations are her weapons ". An important effort to promote Pan-Slavism, and to bring about a political union of the Slavs, was made in 1848, stimulated by the rival efforts at union made by the German nations. A Pan-Slavonic Congress met at Prague (June, 1848), and another at Moscow in 1867. In 1869 Danilevsky, one of the apostles of Pan-Slavism, published his famous work *Russia and Europe*, wherein he outlined Russia's mission and advocated Pan-Slavism under the leadership of that country—the greatest Slav power, and therefore the natural protector of the weaker Slavs. " Russia ", he wrote, " had a mission not only to civilize the Orient, but also to breathe the healthy spirit of the Slav into Europe." Pobiedonoszev, the procurator of the Holy Synod, was another ardent advocate of Pan-Slavism, and the movement received a new stimulus during the European War, when all the Slav peoples united against Teutonic aggression. In reality, however, Pan-Slavism never possessed a reasonable chance of realization. The fact that the Slavonic race comprises nations so bitterly hostile as Russia and Poland, and the diversities of the religious creeds, as Greek Orthodoxy and Roman Catholicism, have made and will make all attempts to unite the scattered elements of such a race impracticable.

Pantellaria, a volcanic island of the Mediterranean, 70 miles south-west of Sicily, of which it is a dependency, included in the province of Trapani; length, north to south, 9 miles; breadth, 6 miles. It produces wine, olives, &c. Pop. 8873.

Pan'theism (Gr. *pan*, all; *theos*, God), the doctrine which teaches the unity of God and the world in the sense that God is synonymous with all-comprehensive Being, whilst the universe consists in modifications of Being. Goethe once remarked that he had never yet met anybody who knew exactly what Pantheism really meant. This was to a certain extent just, and the definition of pantheism is somewhat difficult, as it has been conceived in so many ways by different philosophers. Generally speaking, the fundamental principle of Pantheism is that there is only one Being, absolute, eternal, and infinite beneath the apparent diversity of things. As the etymology of the term indicates, Pantheism teaches that God is everything and that everything is God. It deprives God of all human attributes, and identifies Him with the universe. He is the ever-creative, ever-active force of nature, the cause and design, the spirit, whose thoughts and nature are reality. He is present in every atom of the universe, in every grain of sand in the desert, and in every blade of grass in the field.

" He most gloriously ", writes Heine (*Religion and Philosophy in Germany*), " manifests Himself in man, who both feels and thinks. In man God reaches self-consciousness, and through man He reveals this self-consciousness." According to the different conceptions of pantheistic philosophers, Pantheism either denies any real existence to the world as distinct from the one absolute Being, or it considers the world as part of the Deity, flowing out from it, or again it teaches that God is lost *in* the world.

Pantheism is thus both a system of philosophy and of religion, and is either theistic or atheistic. The pantheism of the Brahmans, and especially that of Spinoza, who had ' drunk divinity in deep draughts from the brimming goblet of nature ', was theistic, whilst the pantheistic doctrine of Haeckel was atheistic. In contradistinction to Deism, which teaches *transcendence*, the principal tenet of Pantheism is *immanence*. There is no personal, extra-mundane God, as anthropomorphic Theism maintains.

> What God would *outwardly* alone control,
> And on His finger whirl the mighty whole?
> He loves the *inner* world to move, to view,
> Nature in Him, and He in Nature, too.

The term Pantheism was first made use of by Toland in 1705, but pantheistic creeds existed long before. The earliest school of Greek philosophy, the Ionian, was pantheistic. Epicurus and Lucretius in ancient, and Giordano Bruno in modern times, were pantheists. St. Paul may be said to be teaching pantheism when he says: " In Him we live, and move, and have our being ". Pantheism has been taught in the *Upanishads* and the *Vedanta*, and Virgil clearly teaches Pantheism in the sixth *Æneid* (724–32). The pantheistic doctrine has been especially elaborated by Spinoza (q.v.), who is considered as the father of modern Pantheism. Schiller and Goethe, Lessing, and Herder were Pantheists, or Spinozists, and Shelley clearly proclaims a pantheistic creed in the following lines:

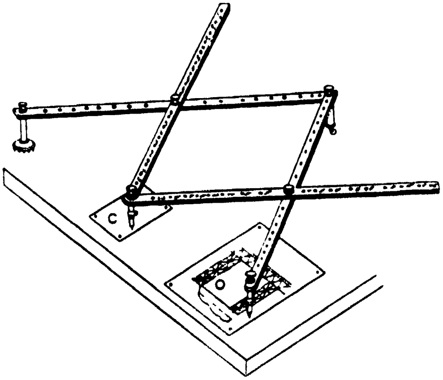
> Yet not the lightest leaf,
> That quivers to the passing breeze,
> Is less instinct with Thee;
> Yet not the meanest worm,
> That lurks in graves and fattens on the dead
> Less shares Thy eternal breath.

—BIBLIOGRAPHY: G. C. Plumptre, *General Sketch of the History of Pantheism*; J. A. Picton, *Pantheism*; F. M. Cornford, *From Religion to Philosophy*; A. M. Fairbairn, *Studies in the Philosophy of History and Religion*; R. Flint, *Antitheistic Theories*.

Pan'theon (or pan-thē'on; Gr. *pan*, all, *theos*, god), a celebrated temple at Rome, built in 27 B.C. by Marcus Agrippa. It is a large edifice of brick, built in circular form, with a portico of lofty columns. It has the finest dome (q.v.) in the world (142½ feet internal diameter, 143 feet internal height), and its portico is almost equally celebrated. Pope Boniface IV transformed it into a Christian church, dedicated to St. Mary of the Martyrs (607). It is now known in Rome as La Rotonda. Raffael, Victor Emmanuel II, and other famous men are buried within its walls. The Pantheon in Paris, for some time the church of Ste Geneviève, is a noble edifice with a lofty dome. Designed by Jacques Germain Soufflot, and constructed between 1764 and 1789, it is devoted to the interment of illustrious men. Among the great Frenchmen whose remains lie in the Pantheon are Voltaire, Rousseau, Victor Hugo, and President Carnot. The heart of Gambetta was buried in the Pantheon in 1919.

Panther (*Felis pardus*), one of the Felidæ or cat family, of a tawny colour, diversified with rosettes of black spots, a native of Asia and Africa. It is identical with the leopard (q.v.). The name panther (in vulgar language *painter*) is given to the puma in America.

Pan'tograph, also called **Pantagraph** (from Gr. *pan*, all, and *graphein*, to write or delineate), an instrument consisting of four limbs joined together by movable joints, and so constructed that by means of it maps and plans may be copied mechanically either on the scale on which they are drawn or on an enlarged or reduced scale. In calico printing a pantograph machine, making use of this action, is employed to a considerable extent to reduce the proposed design to a suitable scale, and transfer it to a varnish-covered copper roll. While the stylus is moved over the design on the pattern plate a number of points cut out a series of reduced facsimiles in the varnish coating. The number of points can be varied to suit the number of repetitions of the pattern in the length of roller. Separate rolls are used for each colour. Afterwards the rolls are etched with nitric acid through the cuts in the varnish.



Pantograph

O, The original. C, The copy.

Pantomime, The, of modern times, is something entirely different from that to which the word was originally applied. Given to-day to a distinct type of theatrical entertainment, the term in Roman days described a special class of performer. The talents of the actor called a 'pantomime' were entirely devoted to mimicry by means of posturing and gestures; his nearest modern counterpart is perhaps our ballet-dancer. These pantomimes were known and popular some centuries before the birth of Christ, but they attained their chief distinction during the Augustan age, at which period Bathyllus and Pylades were the prominent exponents of the art. Such pantomimes attained a place in social popularity which drew the alarmed attention of Tiberius, who thought it necessary to take steps to check their close and growing familiarity with the Roman aristocracy. He forbade the latter to resort to the private houses of the pantomimes or to be found walking with them in the streets. Pantomimes, however, enjoyed considerable imperial favour under Caligula, while Nero in his passion for publicity did not hesitate to join their ranks as an amateur. The art of the pantomime was carried to the highest pitch of excellence. He came upon the stage with his face hidden by a mask, and the emotions he desired to express had therefore to be conveyed to the spectators entirely without the aid of any play of the features; his success depended on the general movement of the body, and more particularly on gesticulation and the action of the hands and fingers. The mythological subjects chosen for representation were usually such as would be familiar to the audience. After the first century female pantomimes began to appear in public, an innovation regarded as scandalous by many, and denounced by Juvenal. It was during the Middle Ages that, in the improvised comedies produced in Italy, there first appeared those characters so long popular in comparatively modern British pantomime—Pantaleone (Pantaloon), Arlecchino (Harlequin), and Columbine. Our clown, who still retains his place to some extent in pantomime to-day and is a leading figure of the circus-ring, would seem to have been a much later introduction. Through the French vaudeville the pantomime at length crossed the Channel to this country, where it was first seen in 1723. In that year *Harlequin Dr. Faustus* was produced at Drury Lane, and competed for popular favour with *The Necromancer, or History of Dr. Faustus*, placed upon the stage at Lincoln's Inn Fields by the lessee, John Rich. From that time pantomime maintained a steady hold upon the public taste; but it was thirty-five years before one of its greatest triumphs was heralded by the appearance of Giuseppe Grimaldi at Drury Lane in 1758 under the auspices of Garrick. Giuseppe's famous son Joseph, the 'clown' *par excellence* of English pantomime, appeared in 1781 when not yet fully two years old, and commenced his career of delighting a lengthy generation of theatregoers. Eighteen years later James Byrne was the first clown to assume the now traditional spangled suit of 'tights', and it was he who, further, broke with the rule which had hitherto kept Harlequin upon the stage throughout the whole performance, figuring in five stereotyped and conventional attitudes. Grimaldi the younger speedily raised the figure of the clown to the most prominent position on the stage of pantomime; but gradually the harlequinade, with its serio-comic Harlequin, the village maiden Columbine, and her lover, were relegated to a less conspicuous position; the harlequinade finally suffered drastic 'cutting', and is now practically extinct. The modern pantomime is an almost unrecognizable descendant of the first importation of two centuries ago. During the nineteenth century something of the original conception held its place, but in the closing thirty years a change set in. Into the fairy tale of *Cinderella*, *The Forty Thieves*, or *The Babes in the Wood* have been gradually introduced topical allusions and songs, with other innovations, until a twentieth-century pantomime partakes of the nature of the variety entertainment offered by the music-hall. A lavish expenditure and much artistic skill are devoted to the production of striking colour-schemes and scenic display in both the setting and costumes; while, in the performers, artistic merit is not seldom subordinated to good looks and other personal attractions. The late Sir Augustus Harris was long prominent as a successful producer of pantomime at Drury Lane; while many provincial towns, among which Bristol specially excels, have long been famous for their annual pantomime. For a history of the subject in general, see A. Pougin's *Dictionnaire historique et pittoresque du théâtre* (Paris, 1885); O. Driesen's *Der Ursprung des Harlekin* (Berlin, 1904); while for the English pantomime may be consulted vols. ii, iv, and v of Dibdin's *History of the Stage*, and the *Memoirs* of Joseph Grimaldi (first edition, 1838).

Pan-Turanianism,[1] an Ottoman political movement which first appeared as such after the disastrous Balkan Wars of 1912–3.[2] It originated in the dreamy ideals of a few 'intellectuals' of Turkey, who desired the expurgation of exotic features, mainly Arabic and Persian, from the Turkish literary language, and the consolidation of the Turanian peoples as a purely Turkish state, inhabited by Turks, and healthily fostered by the old Turkish traditions. The scheme was advanced by peaceful propaganda, and the notion found favour with many progressive Turks, who were fired with the spirit of nationalism and had discovered their affinities with other Turkish-speaking peoples.

The Balkan Wars of 1912–3 raised Pan-Turanianism from an obscure ideal to a political reality, the essential principles being incorporated in the programme of the Committee of Union and Progress. At this time, also, was the focus of Turkish domination removed from Europe to Anatolia; Turkey abandoned her position and traditional dominance as a great European power, and began a new scheme of Anatolian regeneration and Turkification, in which many non-Turk and non-Muslim communities were either assimilated or else completely wiped out. During 1916 Turkish was made the compulsory language for everyday affairs, and, since that time, the break-up of Russia has rendered the unification of the Turanian peoples not only possible but intensely practicable.

It is impossible to think of Pan-Turanianism without considering the policy of Pan-Islamism. The two are diametrically opposed, but they are synonymous in their penultimate and final objectives, which are respectively (*a*) the regeneration of purely Turkish traditions and ideals, and the formation of a militaristic state on the German model; and (*b*) the aggrandizement of Turkey at the expense of European and non-Turkish powers. Recent religious (Muslim) revivalism has been decidedly anti-Ottoman, and Pan-Islamism, despite the Turkish masquerade, is anything but a religious movement. When the objectives are considered, the doctrine which finds most favour with the modern Turkish Government is self-evident, for these objectives

[1] The word 'Turanian' was appropriated by European philologists to describe the languages or agglutinative tongues of Asia and North-Eastern Europe. The Persian word *Turan* is used in Persian mediæval poetry to indicate the steppes and deserts of Central Asia, in opposition to *Iran*, the peaceful, cultivated, and enclosed lands of Persia.

[2] The article *Turanian* should be consulted. A map showing the enormous range of the Turanian peoples accompanies that article. It may be remarked that only the Finns, Magyars, and Osmanli Turks, or those branches which have been in close contact with the Aryan groups of Europe, have been raised from their primitive state to a comparatively advanced degree of civilization.

can be attained more surely on the certain basis of a common language than on a doubtful uniformity of religion. Naturally, however, the Pan-Islamic doctrine has been maintained in the political programme, partly because the policy of Abdul Hamid has faithfully been followed by more recent administrators, and partly because it cannot, for obvious reasons, be scrapped.[1]

Turkish Pan-Turanianism is a modified form of Irredentism, and is the only ideal by which the Ottoman Empire may expect to expand and find some compensation for the vast territorial losses she has sustained within recent times. See *Pan-Islamism*; *Turanian*; *Turkey*; *Palestine*.

Pa'oli, Pasquale de, Corsican patriot, born in 1726, died in 1807. In 1755 he was appointed captain-general by his countrymen, who were struggling for their independence against Genoa. He organized the government and military resources of the island, and maintained a protracted and generally successful struggle with the Genoese. The latter being unable to subdue the island, sold it to France in 1768. Paoli resisted for a time, but was ultimately compelled to yield, and took refuge in England. After the Revolution of 1789 he was recalled by the National Assembly, and made lieutenant-general of Corsica. Disagreements with the Democratic party in France soon led him to throw himself into the arms of England, and through his influence the crown was offered to George III. Subsequently he withdrew to England, and received a pension from the British Government. —Cf. James Boswell, *Account of Corsica and Memoirs of P. Paoli*.

Papacy. The office and authority of the Pope or Bishop of Rome, which, it is claimed, extends over the whole Catholic Church, depends upon an interpretation of the words of Our Lord, "Thou art Peter, and upon this rock I will build my Church" (*St. Matt.* xvi, 18), and upon the belief that St. Peter was Bishop of Rome, and that his supreme authority has descended to his successors. Recent research has tended to confirm the tradition that St. Peter visited, and suffered martyrdom in Rome, and the connection of the imperial city with the two great apostles, St. Peter and St. Paul, tended, after the destruction of Jerusalem, to make Rome the natural centre of the Christian Church. The Bishops of Rome, at all events from the time of Victor in the end of the second century (see list under heading *Pope*), claimed the right of intervention in the affairs of other Churches. This claim was not readily admitted; it was entirely repudiated by the Eastern Church after the transference of the Empire to Constantinople, and the spread of Christianity in Western Europe led to the rise of national Churches (in Spain and Gaul, and among the British and the Irish) which had only a very loose connection with Rome. Even in Italy the barbarian invasions restricted the bounds of Papal authority. The founder of the greatness of the Papacy was Gregory the Great, who began the missionary enterprises which resulted in the establishment among the English and the Germans of Churches bound to Rome by the closest ties, and acknowledging the complete Roman supremacy. These influences ultimately affected France, and, from the time of Charlemagne, the new Western Empire acknowledged the spiritual authority of the Papacy. The Papal claims were assisted by the forgeries known as the False Decretals, and especially by the invention of a story that the Emperor Constantine had conferred upon the see of Rome not only spiritual, but also temporal, authority in Italy and the west of Europe. The rising influence of the Papacy in the seventh and eighth centuries was checked by fresh barbarian invasions and by the disrepute into which the see of Rome itself fell. From this condition it was rescued by the Emperor Otto I towards the end of the tenth century, and for nearly a hundred years Papacy and Empire acted in harmony, the latter being the predominant force. The second founder of the greatness of the Papacy was Gregory VII, who, after making important internal reforms in the Church, challenged the right of the emperor and other temporal princes to invest bishops with their insignia of office (see *Investitures*). The conflict ultimately resulted in a compromise known as the Concordat of Worms, but it greatly increased the prestige of the Papacy. In the course of the struggle the Countess Matilda of Tuscany bequeathed to the see of Rome large territories in Italy, and Papal influence was further extended by the circumstance that the Pope represented the feeling of Christian Europe in the Crusading movement.

The struggle between Papacy and Empire continued throughout the twelfth and thirteenth centuries, and brought about the fall of the imperial House of Hohenstaufen and an interregnum in the Empire. The greatest Pope of the period was Innocent III (1198–1216), who made the influence of the see of Rome felt all over Europe, and also began the consolidation of the Italian territories of the Church into a great Papal State, which ranked as one of the powers of Europe. A decline in Papal authority began in the latter half of the thirteenth century, and successive Popes fell under the domination of the growing power of France. This tendency, after a check in the time of Boniface VIII (1294–1303), culminated in the transference of the Papacy from Rome to Avignon, which was the residence of successive Popes from 1305 to 1377. This 'Babylonish exile' was followed by a series of elections of rival Popes, known as the Great Schism to distinguish it from a similar series of schisms which had occurred during the struggle between Papacy and Empire. It began in 1378, largely through a desire of many of the electing body, the College of Cardinals, to return to Avignon, and it was brought to an end in 1415 by the Council of Constance. A period of comparative peace followed, but the position of the Papacy as an Italian state gave rise to difficulties, and, in the end of the fifteenth century, a succession of Renaissance Popes were rather temporal princes than heads of the Church, and some of them, like Alexander VI, were men of notoriously bad character.

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[1] Despite this, the comprehensive notion of uniting the Turkish-speaking peoples, the scrapping of the word 'Turk', and the introduction of the title 'Turanian' have been widely canvassed. The Nationalists also favour the introduction of pagan pre-Islamic heroes like Jenghiz Khan and Hualagu to oust the Prophet and the Four Pious Caliphs, and Turkish Boy Scouts are permitted and encouraged to carry flags bearing the pre-Islamic Turkish wolf, although animal reproductions of any sort are prohibited by Muslim tradition. The translation of the *Koran* from the sacred language into Turkish has also raised a storm of indignation against Turkey throughout the Muslim world.

The shock of the Reformation seemed likely, at first, to destroy the Papacy altogether, but it was followed by internal reforms, and by the counter-Reformation which re-established the Roman Church in many parts of Europe and especially in Southern Germany. The decisions of the Council of Trent (which closed in 1563) gave a new unity to the Church, and the Society of Jesus proved a great missionary force, while the Inquisition crushed out Protestantism in Spain, the Huguenots ceased to be aggressive in France, and the growth of European colonies in South, and afterwards in North, America extended the sway of Papacy into the New World. In the process of recovery from the first and most formidable effects of the Reformation, the Papacy, under Pius V, Gregory XIII, and Sixtus V, played a remarkable part, and the course of events in the first quarter of the seventeenth century seemed likely to restore to their successors the old authority in continental Europe. But the rise of the power of Sweden and Holland, and the aggrandizement of France, were inimical to the Papal authority, and Gallicanism produced a serious breach between Rome and Paris. In the great European crisis of 1688–9 the sympathy of Innocent XI was with Austria and William of Orange rather than with Louis XIV and the House of Stewart. In the eighteenth century the political prestige of the Papacy declined, its moral influence was attacked by the philosophic movements of the time, and the general unpopularity of the Jesuits led to the suppression of the order from 1773 to 1814. The misgovernment of the states of the Church was notorious, and the French Revolution led to the loss of the temporal power and to the captivity of Pius VI, who died in exile. His successor, Pius VII, made in 1801 a Concordat with Napoleon, and three years later anointed him as emperor, but in 1809 Napoleon annexed the Papal States, and the Pope was a prisoner in France until 1814. After the fall of Napoleon the Papal States were restored, but successive Popes had to depend on foreign military aid to maintain control of them. In 1848 Pius IX, who had been elected two years earlier as a Pope of liberal tendencies, was driven from Rome by a republican outbreak, and when he was restored by the French in 1850, he adopted a repressive policy. Nine years later the greater part of the Papal States was forcibly incorporated in the Kingdom of Italy, and the retention of Rome was possible only with French help, the withdrawal of which in 1870 brought about the capture of Rome by the Italians. Meanwhile, Pius IX had been asserting and extending the spiritual claims of the Papacy. In 1864 he issued a *Syllabus* condemning the tendencies of contemporary thought, and in 1870 his influence over the Vatican Council procured the promulgation, as an article of faith, of the dogma of Papal infallibility—that the Pope, when speaking *ex cathedra*, is divinely endowed with infallibility in defining any doctrine touching faith or morality, and that any such doctrine is binding on the Church. The Council also acknowledged the complete jurisdiction of the Pope in all matters of discipline and government. Pius IX refused to come to terms with the Italian Government, and declared himself 'the prisoner of the Vatican'. The ground on which stand St. Peter's and the Vatican is still Papal territory, and no Pope has gone outside its limits since 1870. Under Leo XIII the Papacy adopted a more favourable attitude towards modern democratic opinions than in the time of Pius IX, and the Roman Church began to take a greater part in the internal politics of various nations. The pontificate of Pius X was chiefly devoted to reforms of organization, and to the suppression of liberal theology or 'modernism', against which the Pope launched an encyclical, 'Pascendi Gregis'. During the short pontificate of Benedict XV the moral prestige of the Papacy was lowered by its dubious neutrality in the European War, and the destruction of the Austro-Hungarian Empire was a further blow to its influence.—BIBLIOGRAPHY: M. J. M. Bell, *A Short History of the Papacy;* M. Creighton, *History of the Papacy* (Renaissance Period); A. R. Pennington, *Epochs of the Papacy;* F. Nippold, *History of the Papacy in the Nineteenth Century.*

Papal States, the name given to that portion of Central Italy of which the Pope was sovereign by virtue of his position. The territory extended irregularly from the Adriatic to the Mediterranean, and subsequently comprised an area of 15,289 sq. miles with 3,126,000 inhabitants. Rome was the capital. The foundation of the Papal States was laid in A.D. 754, when Pepin le Bref presented the exarchate of Ravenna to Stephen II, Bishop of Rome. Benevento was added in 1053, and in 1102 Matilda of Tuscany left Parma, Modena, and Tuscany to the Pope. In 1201 the Papal States were formally constituted an independent monarchy. During the Middle Ages various territories were added to or subtracted from the Pope's possessions, which were incorporated with France by Napoleon in 1809, but restored to the Pope in 1814. A revolution broke out in Rome in 1848, and the Pope fled to Gaeta, but he was reinstated by French troops, and Rome was garrisoned by French soldiers until 1870. In the meantime one state after another threw off its allegiance to the Pope and joined the Kingdom of Italy, and when the French left Rome in Aug., 1870, King Victor Emmanuel took possession of the city, declared it the capital of Italy, and thus abolished the temporal power of the Pope.—Cf. H. E. Manning, *Temporal Power of the Pope*.

Papavera'ceæ, the poppy family of plants, an order belonging to the polypetalous dicotyledons. It contains about 160 species, mostly members of the northern temperate regions. They are smooth herbs, rarely shrubs, with alternate, often cut leaves, and solitary handsome flowers. The poppies are the most familiar members.

Papaw' (*Carica Papăya*, nat. ord. Papayaceæ), a tree indigenous to Latin America, now widely cultivated in tropical countries. It grows to the height of 18 or 20 feet, with a soft herbaceous stem, naked nearly to the top, where the leaves issue on every side on long foot-stalks. Between the leaves grow the flower and the fruit, which is of the size of a melon. The juice of the tree is acrid and milky, but the fruit when boiled is eaten with meat, like other vegetables. The juice of the unripe fruit is a powerful vermifuge; the powder of the seed is manufactured as *papain*, a proteid ferment answering the same purpose. The juice of the tree or its fruit, or an infusion of it, has the singular property of rendering the toughest meat tender, and this is even said to be effected by hanging the meat among the branches.—The papaw of North America is *Asimĭna trilŏba*, nat. ord. Anonaceæ; it produces a sweet edible fruit.

Paper consists of sheets of material prepared by the felting of fine fibres derived from various plants. The art of paper-making dates from very early times. It appears that in the second century the Chinese and Japanese used bark and tow for this purpose. In earlier times written communications and records were inscribed on clay tablets and the waxed surfaces of wood or metal. The Egyptians used the unravelled stem of the papyrus reed and the dried skins of animals in the form of vellum or parchment. During the eighth century the Arabs were using linen and cotton rags for the manufacture of pulp for paper-making, but it was not until about three hundred years later that the art was introduced into Spain by the Moors. From Spain the craft spread to Italy at the end of the thirteenth century, and to France and Germany about a hundred years later.

The first record of paper manufacture in England occurs in Wynkyn de Worde's *De Proprietatibus Rerum*, printed in 1495 at Caxton's Press, wherein mention is made of a mill at Stevenage, in Hertfordshire, belonging to one John Tate. In 1588 Spielman obtained a licence from Queen Elizabeth to make paper at Dartford, in Kent, where some of the finest paper is still made. It was not until about 1685 that the industry was firmly established in England. The first paper-mill in America was erected near Philadelphia in 1690. The method of manufacture was practically the same as that in use at the present day for the production of *hand-made* paper, such as is used for bank-notes, drawing-paper, &c. The rags were thoroughly cleansed, boiled, and beaten into a pulp with water to the consistency of cream. A finely woven wire sieve was dipped into the vat, and sufficient pulp removed to form a sheet of paper. A horizontal shaking motion was given to the sieve, which caused the fibres to felt or interlock, the water draining away through the fine holes in the sieve. The sheet or 'water-leaf' was then placed between felt and subjected to pressure. After drying, the paper was dipped in size (to render it non-porous), and finally dried and smoothed by passing it through rollers under pressure.

Up to the beginning of the nineteenth century every sheet had to be laboriously made by hand, but at this time the first machine for producing paper in bulk in this country was set up by Fourdrinier at a mill at Frogmore, in Hertfordshire. During the last century the paper-making industry developed rapidly, partly as a consequence of the repeal of the paper duty in 1860, but mainly owing to the increased demand for printing surfaces.

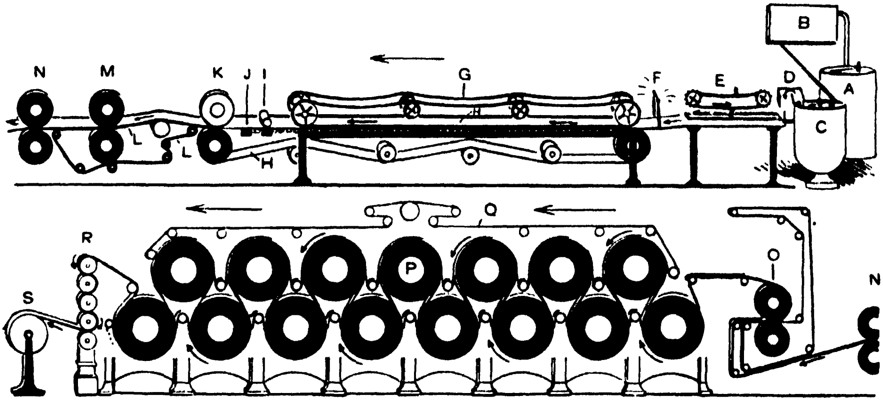
The supply of 'rags' and waste from the textile looms soon proved insufficient for the needs of the rapidly growing industry, and other sources of supply had to be sought. Routledge's experiments with the esparto grasses of Spain and North Africa led to a new source of raw material for paper manufacture, the grasses, after passing through the necessary boiling, beating, and bleaching processes, giving about 50 per cent of their weight of fine fibre. The straw of cereals and the fibre obtained by disintegrating coniferous and other woods are now also largely used in paper-making. The highest grades of paper are still made from rags; flax and hemp produce the most durable papers, followed by cotton, and finally by a mixture of wool and linen. When rags are used, the first process consists in sorting them into different grades. Linens are separated from cottons and are subdivided into various qualities. They are freed from dust by placing them in a revolving wire cage, and then cut into small pieces. In the next process the material is treated in high-pressure spherical rotating boilers with an alkaline solution for a period varying with the quality of the rags. The alkalies employed are either soda or caustic soda, and especially lime. This process serves to destroy colouring-matters and to decompose materials of a fatty and albuminous nature. When the boiling is completed, the liquor is drained off and the rags thoroughly washed. The boiled rags are then placed in a machine in which rotating discs studded with knives reduce them to small pieces. By continued application of this process, sometimes in another machine, the rags are finally reduced to a pulp, which after bleaching and further purification is ready to be made into paper. Other materials, such as esparto and straw, require more drastic treatment. The boiling is carried out in stationary vessels under a greater pressure and with a strong solution of caustic soda, the liquor being circulated by means of steam. The excess of caustic soda is recovered by evaporation of the waste liquors and used again. Wood is treated by two different methods. In the first the dressed logs are disintegrated and torn into fibres by pressing them, sideways on, against a large grindstone revolving about 200 times per minute. The shredded material is then sieved; the coarser fibres are ground in a mill and mixed in the wet state with the fine siftings. This mechanical wood-pulp is only used for very inferior papers, as the fibres are short and the paper soon becomes discoloured. The other method is of a chemical nature. The sliced wood is boiled under considerable pressure with a solution of either caustic soda or calcium bisulphite; this treatment dissolves the non-cellulose constituents of the wood, leaving the cellulose in a suitable state to break up into pulp by further mechanical means. This so-called chemical wood-pulp is of a lighter colour, and produces a better quality paper than mechanical wood-pulp.

For the production of white paper all pulps, except those prepared from white rags, require bleaching. This is carried out by treating the pulp, in a machine called a potcher, with a solution of bleaching-powder (calcium hypochlorite). Great care must be taken to remove all excess of this material after the process is completed, or the strength of the paper will deteriorate on keeping. The usual method is to add a solution of a salt, known as an antichlor, such as sodium hyposulphite or sodium sulphite, to decompose all traces of the bleaching-material which remain. The pulp, from whatever source it is derived, is then further purified by thinning it with water and passing it slowly through long troughs, called sand tables, where any heavy particles fall to the bottom. It is then strained by sucking it through a diaphragm containing narrow slits, which allow the water and fine fibres to pass, pieces of woody matter, and of rags which have escaped pulping, remaining on the upper side. The pulp is then allowed to flow on to a travelling wire cloth, which allows the water to pass through, the mass of fine fibres remaining being removed on a travelling band of felt. This material, which is known as 'half-stuff', resembles thick blotting-paper, and is stored on reels or in bins ready for the final process.

In this operation the half-stuff is beaten up with a quantity of pure water until it is of a thoroughly uniform and milky consistency. Colouring-matters are added at this stage, and also filling or loading materials, such as China clay, barium sulphate, or plaster of Paris, in a pure and very finely divided condition. These serve to fill up the pores of the paper and to give it a more solid texture.

In order to render the fibres of a paper more or less impervious to water, and thus enable it to be used for writing purposes, it is 'sized'. This is performed by adding to the beaten and loaded pulp a solution of resin soap, followed by the addition of a solution of aluminium sulphate. This has the effect of covering the individual fibres with a more or less waterproof medium. The treated pulp is now run into a storage-tank containing agitators, which keep the material thoroughly mixed. From this vessel it flows in a regulated stream on to the endless wire cloth of the paper-making machine, which is of similar construction to that used in the preparation of the half-stuff, but has a finer mesh, and has also imparted to it a lateral motion or 'shake' for the purpose of inducing the fibres to felt in all directions. Most of the water flows through the meshes as the wire cloth moves on. Suction-boxes remove a further quantity of water and assist in consolidating the fibres. If a watermark is to be given to the paper, it is impressed at this stage by means of a 'dandy roller' consisting of wire gauze, and having woven upon it in wire the design of the watermark. The moist paper and the endless wire cloth then pass between felt-covered press-rollers, after which the paper is conveyed by an endless travelling felt between further press-rollers. The paper is then led over a number of steam-heated drying-cylinders, and finally passed between iron rollers in order to compress it and impart a smooth surface to it. Finally, the edges of the paper are cut, and the endless sheet is either wound upon a reel or cut up into sheets as occasion demands.

Hand-made papers are still used for certain purposes; the method of their preparation, which has been already described, has not altered materially during the last century. Such papers are often sized after the sheets are made, animal size being generally used for this purpose.



Diagrammatic Section of a Paper-making Machine

A, Stuff chest. B, Top chest. C, Mixing box. D, Sand trough. E, Strainers. F, Water spray. G, Endless rubber deckle straps. H, Vibrating table covered with endless wire-cloth. I, Dandy roll. J, Suction boxes. K, Couch roll. L, Endless flannel band carrying paper. M, N, O, Press rolls. P, Drying cylinders. Q, Endless flannel band. R, Calendering rolls. S, Reels of finished paper.

Blotting papers and *filter-papers* are made in the same way as ordinary paper, but the pulp is left unsized and unloaded, and for this reason it is absorbent.

Cardboard is manufactured by laying freshly made sheets of paper upon one another, and firmly pressing them together while still damp.

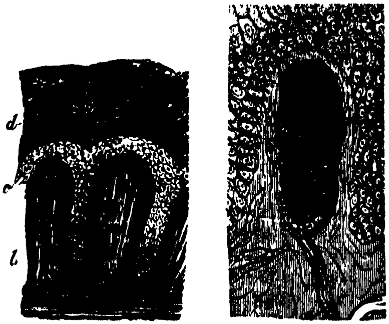
Pasteboard, a similar material, is made by pasting dried and finished sheets of paper one over another till the requisite thickness is obtained.

Papier-mâché is chiefly made from old paper by boiling and beating it to a pulp with water, and mixing the pressed pulp with glue, starch, paste, or other adhesives, and forcing it into a mould. After drying, the articles are treated with linseed oil and again dried at a higher temperature, and finally gilded, painted, or lacquered. Papier-mâché is also made by pasting several sheets of paper on metal cores; the articles are finally polished with pumice-stone and decorated. It is largely used for making bowls, trays, boxes, and other articles where lightness and strength are needed, and also for the production of the mould or 'flong' for casting the curved plates used on the printing-cylinders of modern rotary presses.

Carton pierre and *ceramic mâché* are similar compositions used in decorative work in place of stucco and plaster.

During the last few decades the output of paper in this country and in America has increased enormously. The raw material chiefly used for the production of newspapers consists of wood-pulp, prepared in America and Scandinavia, where wood is plentiful and the water-supply abundant. In England, Lancashire is the largest paper-making centre; some of the finest papers are made near Dartford, in Kent. Scotland possesses mills in the valley of the North Esk. In America the mills are mostly situated in the eastern states. Massachusetts produces a large quantity of high-quality paper, commoner varieties being made in the state of Maine. Recently large mills have been started in Newfoundland for the production of paper for the requirements of the modern press. The imports of paper and paper-making materials into the United Kingdom amount to several millions sterling annually. An enormous variety of papers is now made to satisfy the demands of the modern printer and publisher. In addition, large quantities of pulp are used for the manufacture of brown paper for wrapping purposes, and for wall-papers.—BIBLIOGRAPHY: H. A. Bromley, *Paper and its Constituents*; T. W. Chalmers, *Paper Making and its Machinery*; C. F. Cross and E. J. Bevan, *A Text-book of Paper Making*; R. W. Sindall, *Paper Technology*.

Paphlago'nia, in ancient geography, a mountainous district in the north of Asia Minor, between Bithynia on the west and Pontus on the east, separated from the latter by the Halys. On the coast was the Greek city Sinope. Paphlagonia was first subdued by Crœsus, King of Lydia, and afterwards formed part of the Persian Empire, until its satraps made themselves independent. It was ruled by native princes from 816 B.C. until subdued by Mithridates (63 B.C.), on whose overthrow the district was incorporated with the Roman Empire.



1, Magnified vertical section of skin. *a*, *a*, Papillæ. *b*, Layer of cells covering papillæ. *c*, Rete mucosum. *d*, Horny layer of epidermis. 2, Magnified view of a papilla of skin, with a touch corpuscle.

Pa'phos, two ancient cities in Cyprus—Old Paphos, a little more than a mile distant from the south-western coast, upon a height; and New Paphos (modern *Baffa*), 7 or 8 miles to the north-west of Old Paphos, situated on the seashore. The first was famous in antiquity for the worship of Aphroditē (Venus). At New Paphos St. Paul preached before the proconsul Sergius.

Pa'pias, one of the Apostolic Fathers, Bishop of Hierapolis. He is described by Irenæus as a "hearer of John and a companion of Polycarp", and was martyred at Pergamus in A.D. 163. He was the author of five books on the *Sayings of our Lord*, all lost, except a few valuable fragments, which give important information as to the early traditions regarding the New Testament: e.g. that Matthew's Gospel was believed to have been written in Hebrew, and that the evangelist Mark was the interpreter (*hermeneutēs*) of Peter, and wrote to his dictation.

Papil'io, a genus of butterflies (Lepidoptera), the type of a family (Papilionidæ) including a large number of species native to most parts of the world, especially South America. One of them, the swallow-tailed butterfly (*Papilio machāon*), is found in the English fens.

Papiliona'ceæ, a division of plants, forming a sub-order of the Leguminosæ (q.v.), distinguished by the resemblance of the superior petals of their flowers to the extended wings of a butterfly (Lat. *papilio*). The best-known examples are the pea and bean, which are the typical plants of this division.

Papillæ, the name applied in physiology to small or minute processes protruding from the surface of the skin, or of membranes generally, and which may possess either a secretory or other function. The papillæ of the skin are largely tactile, while those of the tongue produce the sense of taste. Papillæ, modified in structure, are found in internal organs, and possess secretory or other functions.

Papin (pá-paṇ), Denys, French physicist, born in Blois, in France, in 1647, died in 1712. Having visited England, he was in 1681 admitted a Fellow of the Royal Society. The revocation of the Edict of Nantes preventing him from returning to his native country, he settled at Marburg, in Germany, in 1687 as professor of mathematics, retaining this charge till 1707. He is best known for the invention denominated Papin's Digester.

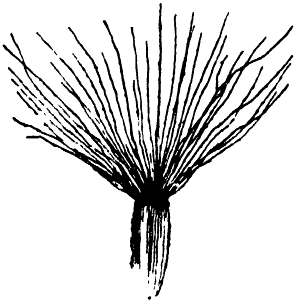
Papinia'nus, Æmilius (Papinian), Roman lawyer, born under Antoninus Pius, about A.D. 140. His learning and integrity won him the first offices of state, and he was ultimately chosen prefect of the prætorian guards under the Emperor Septimius Severus, whom he accompanied to Britain. The Emperor Caracalla caused him to be executed in 212. In the *Pandects* are 595 excerpts taken from his works.

Pa'pion, *Cynocephălus hamadryas*, a species of dog-headed baboon, akin to the mandril. It was held in great reverence in Egypt, selected individuals being kept near the temples, in the caves of which their mummied forms have been often found.

Pappus, Alexandrinus, mathematician, flourished at Alexandria in the fourth century after Christ. All his works appear to have perished, except portions of his *Mathematical Collections*, which are of great value. They include geometrical problems and theorems, a treatise on mechanics, &c.—*Pappus's Theorem* is a fundamental result in projective geometry; it is the special case of Pascal's Theorem (see *Geometry*) which arises when the conic degenerates into two straight lines.

Pappus, in botany, the feathery appendage that crowns many single-seeded seed-vessels, for example, the down of the dandelion.

Papu'a, an Australian dependency in the south-eastern part of the Island of New Guinea, including the adjacent islands of the Trobriand, Woodlark, Louisiade, and d'Entrecasteaux groups. Papua lies wholly within the tropics; the northernmost point touches 5° s. lat., and the southernmost portion (comprising Sudest and Rossel Islands) lies between 11° and 12° s. lat. It is separated from Australia by Torres Strait, and has a length from east to west of 800 miles; area, 90,540 sq. miles. The coast-line has a total length of 3664 miles, of which 1728 are on the mainland and 1936 on the islands. A mountain-chain rises in the eastern end of the territory, forms a great central ridge, and extends westwards as the Owen Stanley range (Mount Victoria, 13,200 feet). On the western side the coastal territory is low and swampy for a distance of nearly 300 miles. The mountains and much of the lowlands are afforested, and streams are many, the largest draining to the Gulf of Papua. The Fly River drains a large area of Dutch territory. It has a length of 620 miles within the Australian dependency, and is navigable by steam-launch for over 500 miles. Other rivers are the Turama and Purari.



Achene with Pappus

Communications.—There are many good harbours and four ports of entry, viz. Port Moresby, Daru, Misima, and Samarai. Communication is purely maritime—by large steamers every three weeks ex Sydney to Port Moresby, thence by coasting-vessels to convenient ports. All the ports of entry, excepting only Daru, have wireless installations.

Social Conditions: People.—The native Papuans are a people whose ethnological affinities have never been properly settled. As the interior of the country is unexplored, their number is only guessed at from 250,000 to 500,000. Their languages and dialects are widely varied. Some tribes have settled down to peaceful habits, and 104 missionaries (1921) are engaged among them. The European population consists mainly of Government officials, planters, store-keepers, clerks, and miners. Asiatics and Oceanic races are also represented.

Currency.—Commonwealth notes are legal tender, and the currency is identical with that of Australia and the Motherland.

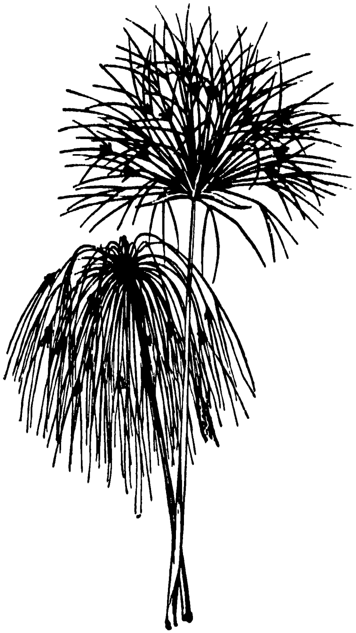
Education.—A number of missionary schools is scattered throughout the territory, and the attendance of native children is compulsory where English is taught.

Production: Agriculture.—In 1920 there were 256 plantations, with 62,162 acres planted, the principal crops being coco-nuts, rubber, and sisal-hemp. Secondary products are bowstring hemp, kapok, coffee, tobacco, vanilla, cocoa, tapioca, cinnamon, tea, rice, and maize. Natives are compelled by law to plant coco-nuts for home consumption. *Forestry.*—120 varieties of timber have been catalogued. Sandal-wood is indigenous, and sandal-oil is distilled from its roots. Ebony is produced for export. *Indigenous Products.*—These include native rubber (*Ficus Rigo*), sugar-cane, cotton plants, nutmegs, ginger, bamboos, palms, bananas, bread-fruit, edible nuts, sago-palms, and species of vegetables and fruits. Mangrove bark is exported for tanning purposes. *Fisheries.* — Pearl-shell fishing is important; bêche-de-mer and trochus shell are found. *Minerals.*—To date the following minerals have been discovered: gold (alluvial and river-dredged), copper, tin, lead, zinc, cinnabar, osmiridium, iron, gypsum, manganese, sulphur, graphite, chromite, lignite, and petroleum. Topaz and beryl are the only gems. Large beds of good coal are supposed to exist.

History.—Surveys of the east coast of New Guinea demonstrated to Queensland and to Australia generally the danger to her commerce which would be consequent upon foreign possession of the islands and coasts opposite to Cape York, and of the entrance to the splendid water-way inside the Barrier Reef. Queensland accordingly annexed the mainland opposite her shores east of the 141st meridian, but her action was discountenanced by the Imperial Government, and it was not until 1884 that the Protectorate was proclaimed. It was subsidized by Queensland, New South Wales, and Victoria until 30th Sept., 1888, when it was declared a Crown colony of the empire. On 1st Sept., 1906, Papua was placed under the authority of the Commonwealth of Australia, by whom it is now divided into eight magisterial districts. It is not an integral part of the Commonwealth.

BIBLIOGRAPHY: *Stewart's Handbook of the Pacific Islands*; J. H. P. Murray, *Papua, or British New Guinea*; W. N. Beaver, *Unexplored New Guinea*; R. W. Williamson, *The Mafulu Mountain People of British New Guinea*; *Official Year Book* (Commonwealth of Australia, No. 14, 1901-20).

Papy'rus (*Papȳrus antiquōrum*, or *Cypērus* *papy̆rus*), an aquatic plant belonging to the nat. ord. Cyperaceæ or sedges. It has acquired celebrity from furnishing the paper of the ancient Egyptians. The rhizome is very large, hard, and creeping; the aerial stem is several inches thick, naked, except at the base, 8 to 15 or more feet high, triangular above, and terminated by a compound, wide-spreading, and beautiful umbel, which is surrounded with an involucre composed of eight large sword-shaped leaves. The little scaly spikelets of inconspicuous flowers are placed at the extremity of the rays of this umbel. Formerly it was extensively cultivated in Lower Egypt, but is now rare there. It is abundant in the equatorial regions of Africa in many places, and is found also in Western Africa and in Southern Italy. The inhabitants of some countries where it grows manufacture it into various articles, including sail-cloth, cordage, and even wearing-apparel and boats. Among the ancient Egyptians its uses were equally numerous, but it is best known as furnishing a sort of paper. This consisted of thin strips carefully separated from the stem longitudinally, laid side by side, and then covered transversely by shorter strips, the whole being caused to adhere together by the use of water and probably some gummy matter. A sheet of this kind formed really a sort of mat. In extensive writings a number of these sheets were united into one long roll, the writing materials being a reed pen and ink made of animal charcoal and oil. Many papyrus manuscripts still extant are of little value, but others discovered in Egypt have given us valuable Greek works, such as the *Orations* of Hyperides, Aristotle's *On the Constitution of Athens*, poems of Bacchylides, &c.—Cf. Sir F. G. Kenyon, *The Palæography of Greek Papyri.*



Heads of Papyrus Plant

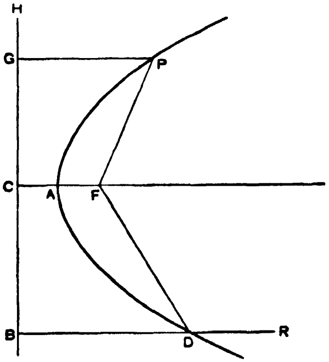
Para, a small Levantine coin, of copper or copper and silver alloy, representing the fortieth part of a Turkish piastre (gurush). In Turkey pieces of 40, 10, 5, and 1 paras are minted. A Serbian para is equivalent to a centime; 100 of them equal the Serbian dinar, and pieces of 50, 20, 10, 5, 2, and 1 are minted.

Pará, state of Brazil, one of the largest and commercially the most important: the most northerly of the republic. It occupies both sides of the Lower Amazon, and consists chiefly of vast alluvial plains connected with this river and its tributaries. These latter comprise the Tapajos and the Xingu, besides many others, the Tocantins being another great stream from the south. The province possesses immense forests, and is extremely fertile, but there is little cultivation, the inhabitants being generally fewer than one to the square mile. The trade centres in the capital, and is facilitated by steamboats navigating the Amazon and Tocantins. Much rubber is produced. Area, 443,790 sq. miles; pop. (1920), 992,290.

Pará, or **Belem Do Pará**, a city and seaport of Brazil, the capital of the state of Pará, on the estuary of the Pará or Tocantins. The principal buildings are the Governor's palace, the cathedral, and the churches of Santa Anna and São João Baptista. It is the seat of the Legislative Assembly of the state. The port, defended by forts, is capable of admitting vessels of large size. The principal exports are rubber, cacao, Brazil-nuts, rice, piassava, annatto, and cotton. Pop. estimated at over 170,000.

Parable, a fable or allegorical representation of something real in nature or life, from which a moral is drawn for instruction. The word is derived from the Greek *parabolē*, which literally signifies ' a throwing beside ', and hence a comparison or illustration. By the Hellenistic writers the word is used almost invariably as the equivalent of the Hebrew *mashal*, meaning similitude, and applied alike to short proverbs, dark prophetic utterances, and tales illustrative of moral truths. All the evangelists, except John, who employs the term *paroimia*, use the word to designate the parables of Christ. The parable is a mode of teaching peculiarly adapted to the Eastern mind, and was common among the Jews before the appearance of Christ. It is exemplified in the Old Testament in the parable addressed by Nathan to David (*2 Sam.* xii), and there are frequent examples of it in the *Talmud*.—Cf. G. Murray, ***Jesus and His Parables.***

Parab′ola, one of the curves known as conic sections. The method of obtaining a parabola from a right cone is explained at *Conic Sections*. It may also be defined as the curve traced out by a point which moves in such a way that its distance from a fixed point, called the 'focus', is always equal to its perpendicular distance from a fixed straight line, called the 'directrix'. In the figure BH is the directrix and F the focus, while P is a point that moves so that the perpendicular GP is always equal to the line PF; the curve PAD described by a point so moving is a parabola. The line FAC through the focus and perpendicular to the directrix is the axis or principal diameter; any line parallel to it, as BDR, is a diameter. The path of a projectile in vacuo, when not a vertical straight line, is a parabola.



Paracel′sus, or Philippus Aureolus Theophrastus Bombastus von Hohenheim, born at Einsiedeln, in the canton of Schwyz, in Switzerland, in 1493, died in 1541. Dissatisfied with the means of acquiring knowledge in his native country, he travelled over the greater part of Europe, everywhere seeking to add to his knowledge. In the course of his travels he became acquainted with remedies not in common use among physicians (probably preparations of mercury), by means of which he performed extraordinary cures, and obtained a great reputation. In 1526 he accepted the chair of medicine offered him by the magistrates of Basel, and lectured there till the spring of 1528. The failure of a lawsuit, and the consequent quarrel with the judges, led him to resume his wandering life, at first accompanied by his pupil Oporinus, who, however, disgusted with his violence and intemperance, at length left him. He died at the hospital of St. Sebastian at Salzburg. For a long time he was regarded as little better than a charlatan, but he enriched science, particularly chemistry and medicine, with some valuable discoveries, and, indeed, is sometimes looked upon as the founder of modern therapeutics.—Cf. A. M. Stoddart, ***Life of Paracelsus.***

Parachutes. A parachute consists of a circular piece of fabric, usually silk, 28 feet in diameter with cords, attached at intervals round the periphery, leading to a suspension rope to which the harness worn by the parachutist is attached. A small circular hole, or 'vent', is cut in the centre to allow air to escape in order to avoid excessive oscillation. This and the 'fluting' round the edges resulting from the pull of the cords reduces the effective diameter to about 20 feet. Hence, with an 11-stone man the surface is loaded to about ½ lb. per square foot, which will reduce the rate of descent of a man of the above weight to 16 feet per second (approximately 11 miles per hour). This produces a shock on landing equivalent to jumping off a wall 4 feet high. A parachute will open to its full extent in about five or six seconds, or after a drop of about 100 feet. A parachutist has jumped without harm from the top of the Tower Bridge in London—a height of 153 feet. An aircraft parachute is packed in the following manner: The centre of the parachute is attached by a loop of light cord to the top of the inside of the case, and the parachute is then laid in folds in the case with the cords put in last. A light canvas cover, with a hole in the centre for the main suspension rope, is then attached to the bottom of the case by four loops of light cord. The case is then firmly attached by its top to the aircraft, and the suspension rope attached by a spring hook to the harness worn by the parachutist. On jumping, the weight of the parachutist coming on the suspension rope breaks away the canvas cover of the case, and the cords and folds of the parachute drop down out of the case. When these are all clear the weight comes on the light cord loop attaching the centre of the parachute to the top of the case and on this breaking, the parachute falls clear and gradually opens as the air gets inside the folds.

There are other types of parachute fitted with various mechanical devices to ensure rapid opening, but the type described is the oldest, simplest, and, on the whole, most reliable if carefully packed in such a way that there is no fear of the cords being entangled. Parachutes which are contained in a case worn on an aeroplane pilot's back are known as 'pack-type' parachutes. The invention of the parachute is attributable to Leonardo da Vinci (A.D. 1500), the famous Italian artist and scientist; while the first parachute descent was made from a balloon in 1797 by a Frenchman named Garnerin.

Paradise, a name introduced into modern languages for the Garden of Eden, and hence used to indicate any abode of happiness. The word is derived from the Persian *pairidaeza*, signifying a garden or deer park of the Persian kings, and was introduced into the Greek language in the form of *paradeisos* by Xenophon, who became acquainted with it probably during the expedition of the Ten Thousand. In his *Divina Commedia* Dante gives a description of Paradise as conceived in mediæval times. The place between Paradise and Purgatory, where sinners who have sinned unconsciously and without intention are awaiting the Day of Judgment, is termed the Paradise of Fools.

Par'adox, a statement or proposition which seems to be absurd, or at variance with common sense, or to contradict some previously ascertained truth, though, when duly investigated, it may prove to be well founded. Among modern writers who are masters of paradox may be mentioned G. B. Shaw, G. K. Chesterton, and Oscar Wilde.

Paradox'ure (*Paradoxūrus niger*), an animal of the civet family (Viverridæ), common in India, and known also as the palm-cat from its habit of climbing palm trees to eat their fruit. It can curl its tail into a tight spiral.

Paraffin, the name given to the members of a series of chemical compounds containing hydrogen and carbon (see *Paraffin Series*). In the popular sense paraffin includes paraffin-oil used for burning, liquid paraffin used medicinally, and paraffin-wax. These are all obtained from sources of mineral origin, namely, from oil-shale, natural petroleum (q.v.), brown coal-tar, and ozokerite.

Dr. James Young founded the oil-shale or paraffin industry in Scotland in 1850, and it is still very largely confined to that country.

The shale is distilled in long, upright retorts, whereby an impure and tarry-looking oil is collected. One ton of shale yields from 22 to 38 gallons of crude oil. This crude or mixed oil is then purified by further distillation to remove fractions of lower boiling-point. The remaining oil is cleansed by treatment, first with strong sulphuric acid, and, after being allowed to settle, with a solution of caustic soda. It is then distilled fractionally, and yields products in the following order: naphtha or petrol up to 150° C., paraffin-oil from 150° C. to 300° C., and, above 300° C., a small quantity of lubricating oil. The heavy residue which does not distil over is frozen to a solid mass of impure wax known as scale. This crude wax is purified in several stages. First it is melted and treated with a small proportion of naphtha; then resolidified or caked and placed in a hydraulic press to remove oil and greasy hydrocarbons. This treatment is repeated till all such impurities have been removed. The next step is to remove all traces of the odour of naphtha. This is done by treating the melted wax with high-pressure steam in iron vessels. Finally the wax is decolorized by being mixed, while still liquid, with animal charcoal or other decolorizing substances. After standing for some time it is filtered to remove particles of charcoal. The resulting liquid is quite clear and colourless, and when solidified is ready for making into candles, &c. Paraffin-oil and wax are obtained from petroleum and coal-tar by methods of fractional distillation similar to that already described.

Ozokerite (q.v.) is the only naturally occurring form of paraffin-wax. It is a fairly pure wax, melting at from 60° to 80° C., and miners' candles have long been made from it in the districts where it is found. A substance called ceresin, closely resembling bees'-wax, is prepared from ozokerite. Pure paraffin-wax is a white, semi-transparent solid which melts between 40° C. and 65° C. It is lighter than water, having a specific gravity of about ·9. It is used chiefly for making candles, which consist of about 90 per cent of wax and 10 per cent stearic acid. These candles are superior in illuminating power to those made from spermaceti and bees-wax. Its other uses are for soaking match-flints, rendering paper transparent, dressing cloth, and making materials waterproof.

Paraffin-oil is a colourless liquid of high boiling-point and specific gravity about ·85. It is used for burning, and can serve as a lubricant.

Pure liquid paraffin is tasteless and odourless, the disagreeable smell of ordinary paraffin being due to a small quantity of impurity. Pure refined liquid paraffin is used medicinally.

Paraffin Series, a homologous series of hydrocarbons of general formula C_nH_{2n+2} (where n = number of carbon atoms). The simplest of these hydrocarbons is *methane* or marsh gas (CH_4). It is a colourless gas and is the product of decay or breakdown of many carbonaceous substances. The members of the paraffin series may all be prepared by the same general methods; for instance, if the corresponding sodium salt of the fatty acid be distilled with soda lime, the hydrocarbon is obtained, e.g. sodium acetate heated with soda lime yields methane, $CH_3COONa + NaOH = CH_4 + Na_2CO_3$; or, if alkyl halide be treated with sodium, the halogen is removed, two alkyl groups unite, and a paraffin is formed, $2C_2H_5I + 2Na = C_4H_{10} + 2NaI$. These paraffins are insoluble in water, the lower members are readily soluble in alcohol and ether, and the solubility in these solvents decreases with increase in molecular weight. The lower members of the series are gaseous: methane (CH_4), ethane (C_2H_6), propane (C_3H_8), butane (C_4H_{10}); then follow a series of colourless liquids: pentane (C_5H_{12}), hexane (C_6H_{14}), heptane (C_7H_{16}), octane (C_8H_{18}), &c.; and finally those members with more than sixteen carbon atoms in the molecule are colourless waxy solids.

They are saturated hydrocarbons and are not readily acted upon by chemical reagents, hence the name *paraffins* from two words meaning 'little affinity'. Chlorine attacks the paraffins, forming substitution products. Thus methane treated with chlorine forms methyl chloride (CH_3Cl), methylene chloride (CH_2Cl_2), chloroform ($CHCl_3$), carbon tetrachloride (CCl_4), depending on the conditions and the amount of chlorine used. Numerous cases of isomerism occur in the series; there are two hydrocarbons of formula C_4H_{10}, three of formula C_5H_{12}, five of formula C_6H_{14}, &c. The boiling-points of the normal paraffins steadily rise as the molecular weight increases, the specific gravity increases, and the solubility decreases.

Industrially the paraffins are important; they are obtained by the destructive distillation of wood and coal, and from oil deposits in various parts of the world. Petroleum, earth oil, rock oil, or mineral oil contains paraffins in varying proportion. How these hydrocarbons have been formed is not known; according to some theories, petroleum has been produced by heat and pressure on the fatty remains of fish. Moissan suggested that they have been produced by the action of water on metallic carbides in the interior of the earth. American petroleum consists almost entirely of normal paraffins, with small quantities of other hydrocarbons. The paraffins are applied in quantity for illuminating and heating purposes, also as solvents for oils and resins. Paraffin-wax is a mixture of higher solid hydrocarbons of the series, and about 350,000 tons of the material are produced annually from petroleum and shale-oil.

Pa′raguay, an inland republic of South America, extending between the Rivers Paraná (east) and Pilcomayo (west), and bisected by the Paraguay, the eastern region being known as the 'Oriental', and the region west of the river as the 'Occidental'. Paraguay Oriental may be described as Paraguay Proper. It is the more populous region, and has been divided by nature into two fairly well-defined zones: west and south, large open plains with patches of forest, drained by numerous streams; east and north, high, rolling country, covered with immense forests, relieved, here and there, by scanty patches of grazing-land. It is divided into twelve departments, subdivided into ninety-three *partidos*. Area, 75,673 sq. miles.

The Chaco Territory (Paraguay Occidental) has roughly the shape of an inverted triangle, with an arbitrary northern base to Chuquisaca Province, Bolivia, the enclosing sides (Rivers Paraguay and Pilcomayo) meeting as an apex at their confluence below Asunción. By the Buenos Aires Treaty (1876), when the respective frontiers of Argentina and Paraguay were fixed, the President of the United States, in arbitration, awarded to Paraguay all that portion of the Gran Chaco between the Rio Verde and the Pilcomayo (1878). It consists mainly of grassy plains, palm groves, and great forests of valuable timbers, and although largely unexplored, it is gradually being opened up to civilization. Paraguayan sovereign rights in this region are disputed by Bolivia, but meantime the Asunción Government is in control, and the Chaco Territory is divided into three military *comandancias*. Area, approximately 100,000 sq. miles. The capital of Paraguay is Asunción (pop. 1921, 75,000).

Climate.—The climate of Paraguay is temperate, and the year has two seasons, summer (October to March) and winter (April to September). The temperature varies between 81° F. in summer and 71° F. in winter, with a mean of 75° or 76° F.

Social Conditions: the People.—In Paraguay Proper the inhabitants comprise Guaraní Indian people, Europeans, and some negro blood, but the Guaraní element predominates. The total population (1917) is about 1,000,000, exclusive of the Chaco Indians, approximately 50,000 to 60,000 in number. The foreign (European) populations received a large increase at the close of the European War by the immigration of Germano-Austrian citizens numbering upwards of 1000, but the bulk of the non-Paraguayan people are either Argentinian or Italian, with small numbers of Brazilians, French, English, and about 7000 Spanish. *Language.*—The official language of the state is Spanish, but Guaraní is universally spoken, and in places Tupi is understood. *Currency.*—Paper dollars (20 = £1 sterling British) and nickel coins are in circulation. No gold or silver is current, but the gold dollar ($5·33 gold to £1 sterling British) is the basis. *Weights, &c.*—In 1901 the metric system was adopted, but the native arroba = 25·35 lb., and quintal = 101·4 lb., &c., are still in use. *Religion.*—The established State religion is Roman Catholicism, but freedom and toleration are granted to all creeds, even to the Mennonites, who are obnoxious to America in general. Asunción is suffragan to Buenos Aires, and is the only bishopric. *Education.*—By law education is free and compulsory, but in many cases it cannot be enforced, as there are no schools. The system is generally at a low ebb, but there are national colleges (secondary schools) at Asunción, Villa

Rica, and Pilar, and a university at Asunción, granting degrees in law and medicine, and certificates in accountancy, pharmacy, and obstetrics. There are also six normal schools, a national library, and a botanic-zoological garden under the department of Public Instruction. *Defence.*—A small standing army on the Prussian model is maintained, comprising about 100 officers and 2500 men. Military service is general and compulsory for two years. All Paraguay is divided, for defence purposes, into five military zones. There is a river flotilla of three gunboats with an aggregate of 200 tons.

Economic—Communications.—Paraguay suffers greatly from the inadequacy of her inland transport systems, and, although provided with splendid and extensively used natural water-ways, these require cleaning, and in some parts dredging, to be efficient. *Railways.*—The Paraguay Central Railway[1] runs from Asunción to Encarnacion on the Rio Alto Paraná (232 miles), where it is linked up with the system of Argentina at Posadas by means of a train-ferry. The gauge is standard (4 feet 8½ inches). A metre-gauge railway (El Ferrocarril del Norte) runs from Concepcion to Horqueta (27 miles). The Azucarera Paraguaya at Tebicuari, in the department of Ibytimi, and several of the Chaco tannin factors, own industrial lines of metre gauge and 10 to 50 miles in length for the transport of their own raw materials. From Posadas there is a large tourist traffic to the famous Iguazú Falls, situated 20 miles from the mouth of the Rio Iguazú, a tributary of the Paraná. They are nearly 3 miles wide, and are broken up by rocks and islets into a score of falls, the highest of which is 215 feet (cf. *Niagara*, which are much smaller in every way). Light-draught steamers leave Posadas, and steam up the Paraná to the mouth of the Iguazú, where passengers are transferred to canoes. Canoes are the only means of reaching the falls, and for journeys beyond it a portage of nearly 40 miles is necessary.—*Telephones and Telegraphs.*—The telephone system of Asunción was destroyed by fire in 1913. A line of telegraph extends alongside the railway; the national telegraph (1440 miles of wire and 915 miles of line) affords communication between Asunción and the outside world via Posadas, Corrientes, and the Argentine. There are wireless stations at Asunción, Concepcion, Encarnacion, and Paraguari, said to have radii of 300 miles by day and 600 miles by night. *Tramways.*—Asunción boasts an electric tram service, and a steam tramway completes the 10 miles between the capital and San Lorenzo.

Production.—Paraguay is climatically suitable for the cultivation of subtropical products, and much of the land in the Chaco regions particularly is utilized for grazing. *Agriculture.*—Yerba-maté, or Paraguayan tea, a natural product of the virgin forests, but also laid down in plantations, is one of the principal crops. Tobacco, sugar-cane, cotton, rice, ground-nuts (used locally for food, the oil being utilized for soap-making), and fruit (grape-fruit, mangoes, and alligator pears for Buenos Aires markets) are the chief agricultural products. Orange trees are found in enormous quantities all over the country, but, through lack of transport, the bulk of the crop (including tangerines) is sold in Argentina, 30 per cent being lost through damage in transit. During the last seven years (to 1922) the average annual shipments amounted to 12,760,000 dozen. *Forestry.*—Timber is available in practically unlimited quantities, and thousands of miles of virgin forest are untrod and untapped. Many rare and valuable woods are found but are uncut, the cheaper timbers finding a readier market. In the Chaco, quebracho is the only timber cut for commercial purposes (see *Manufactures*). *Minerals.*—Mineral resources are unexplored, but workable deposits of rich iron ore exist in many parts, and there are several deserted mines that were used by Lopez in war-time. Rich deposits of magnetic iron, hydric oxides, and brown hematite exist in the vicinity of Ibicui, Quiquyo, and Caapucú; copper pyrites and peroxide of manganese are also abundant, as are limestone (much worked), marble, granite and porphyry, serpentine, kaolin, and large beds of lithographic stone. Natural deposits of salt exist at Lambaré. Oil exists, but there is no coal.

Manufactures.—Petit-grain oil is obtained from the leaves of the bitter orange tree, and is a staple article of export. There are two breweries (Asunción), some soap-factories, tanneries, lime- and cement-factories, a large flour-mill (Asunción) grinding wheat from Argentina, and a biscuit-factory. There are seven sugar-factories but no refinery, and only ordinary unrefined sugar is produced. During the European War cattle-raising progressed rapidly, and there was a boom in meat-packing, but all the canneries have now closed down. The quebracho industry is confined to the Chaco, and the logs are absorbed by the tannin-factories, which turn out extract of quebracho or tannin at the rate of about 22,600 tons per annum (seven years' average to 1922). There is some shipbuilding of flat-bottomed barges (20 to 100 tons), and at Asunción, Concepcion, Encarnacion, and Pilar there are sawmills. Wooden articles (broomsticks, cigar-boxes, and office furniture, &c.) are also made in the capital. *Imports and Exports.*—The largest imports are from Argentina and the United Kingdom, with the United States a bad third. Exports are chiefly to Argentina, but it must be recollected that all imports and exports pass through Argentina, and statistics of goods in transit naturally inflate those of that country.

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[1] The Company have a concession permitting them to extend their line to Bella Vista, on the Brazilian frontier. Dr. Cincinnato Braga, a Brazilian engineer and agriculturist, has obtained from Brazil a concession for the construction of a railway running due west from Porto União, on the line connecting São Paolo with the Uruguayan border, to Villa Rica on the Central Paraguay line. This line will cross the Paraná River *en route*, and will skirt the northern edge of Misiones (North Argentina). A branch line already runs east to the Brazilian coast at São Francisco, and this link would offer for the first time to North Paraguay a quick, direct route to the sea. A second concession permits the construction of an extension of the existing South Brazilian Railway system from the Rio Paraná opposite Tibiriça to Porto Alegro, where the track will bifurcate, one branch extending to Ponte Poro on the Brazilio-Paraguayan frontier, whence a line will be projected from Asunción. River-steamers from the Paraguayan capital will also serve Porto Murtinho (on Paraguay River), another proposed railhead. The vast importance of such and other systems cannot be overestimated, for, when completed, they will enable Paraguay to compete on an equal basis with the other great South American powers for a place in the world's markets that is at present denied her.

History.—Sebastian Cabot discovered modern Paraguay in 1527. Asunción was established as a port by Juan de Ayolas in 1535, and from it the Spanish *conquistadores* reduced La Guayra and the Gran Chaco. All the Spanish territories were known as Paraguay, which at that time included large slices of Brazil, Argentina, and Uruguay. The Franciscans and Jesuits followed each other as missionaries, and in 1776 Paraguay, which had been erected into a separate government in 1620, became subordinate to the vice-royalty of Buenos Aires. Paraguayan independence of Spain was declared in 1811. The administration passed (1815) into the hands of Dr. J. G. R. Francia, who, as dictator, exercised absolute power until his death (1840), when, after a short interregnum, Carlos Antonio Lopez, his nephew, was appointed joint consul (1842). In 1844 a National Congress elected Lopez to the presidency, and on his death (1862) he was succeeded by his son Francisco Solano Lopez (q.v.), who promptly (1864) quarrelled with the Brazilian Government, marched his armies through Argentina to the invasion of Brazil, and fought for five years the Argentina-Brazil-Uruguayan coalition, who invaded Paraguay. At the close of the war Lopez was killed in the battle of Aquidaban, or Cerro Corá (1st March, 1870), but by that time nine-tenths of the male population of Paraguay had been exterminated. The Brazilian army of occupation was evacuated in 1876, and only the whole-hearted efforts of Argentina, with one eye fixed on the balance of Latin American power, prevented the annexation of Paraguay by her conqueror.

Government.—The present Constitution was adopted on 25th Nov., 1870. The executive is in the hands of a President (elected for five years) and five ministers; the legislative authority is vested in a Senate (one paid member to 12,000 inhabitants) and a Chamber of Deputies (one paid member to 6000 inhabitants), both Houses being chosen by universal suffrage. The electoral law of 1916 provides for 20 Senators and 40 Deputies. The Vice-President of the republic is President of the Senate.

BIBLIOGRAPHY: W. H. Koebel, *Paraguay*; W. Parker, *Paraguayans of To-day*; A. R. Hope-Moncrieff, *New World of To-day* (with economic data by Lionel W. Lyde); F. W. Paris, *Report on the Economic and Financial Conditions in Paraguay, September, 1921* (British Department of Overseas Trade publication); *The Paraguayan Chaco* (*Geographical Journal* for Sept., 1919).

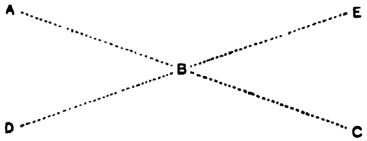
Paraguay, a river of South America, which rises in the Brazilian state of Matto Grosso, takes a course generally southwards, and joins the Paraná at the south-west angle of the state of Paraguay after a course of some 1800 miles. It receives the Pilcomayo, Vermejo, and other large rivers, and is a valuable highway of trade to Paraguay and Brazil.

Parahyba (pá-rá-ē'bá), a maritime state of Brazil, between Rio-Grande-do-Norte on the north and Pernambuco on the south. Cotton and cassava are raised. There is a wet season from March to June. Area, 24,846 sq. miles; pop. 785,844. The River Parahyba traverses the state. It rises in the Pernambuco borderland, and falls into the Atlantic after a course of 270 miles. The state capital is Parahyba, on the river estuary, with an outport at Cabedello farther down. Pop. 20,000.

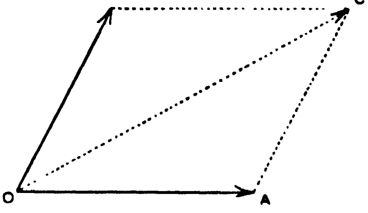
Parakeets, or **Parroquets**, a sub-family or group of the Parrots, characterized by their generally small size and their long tail-feathers. The islands of the Eastern Archipelago form the chief habitat of these birds, but species also occur in India and Australia. Amongst the most familiar forms are the rose-ringed and Alexandrine parakeets. The former (*Palæornis torquāta*), found in India and on the eastern coasts of Africa, has a bright-green body and a pink circle round the neck. The Alexandrine parakeet (*P. alexandri*) of India is a nearly allied species. These birds may be taught to speak with distinctness. The ground parakeets of Australia live amongst the reeds and grass of swamps, generally in solitary pairs. The common ground parakeet of Australia (*Pezopŏrus formōsus*) possesses a green and black plumage, the tail being similarly coloured, and the body-feathers having each a band of dark-brown hue. The grass parakeets of Australia, of which the small warbling parakeet (*Melopsittăcus undulātus*) is a good example, inhabit the central flat lands of Australia, and feed on the seeds of the grasses covering the plains. They perch on the eucalypti or gum trees during the day, and the nests are situated in the hollows of these trees.

Par'allax, the apparent change of place which bodies undergo by being viewed from different points. Thus an observer at A sees an object B in line with an object C, but when he moves to D it is in line with E, and seems to have gone backward.

In astronomy, the parallax of the sun, moon, a planet, or comet means the difference in its apparent position when viewed from the surface and (hypothetically) from the centre of the earth. This difference vanishes when the object is overhead, and is greater when it appears on the horizon. In the latter instance it is called the *horizontal parallax*, often, however, simply the parallax. For distinction, in other cases the expression *parallax in altitude* is used. In the case of a star (or a nebula), parallax means the angle subtended by the radius of the earth's orbit at the star's distance. It is thus the maximum distance to which the star appears displaced from its mean, or heliocentric position, on account of our revolution round the sun. For the star supposed to be nearest to us, it amounts to only 0·76 seconds.



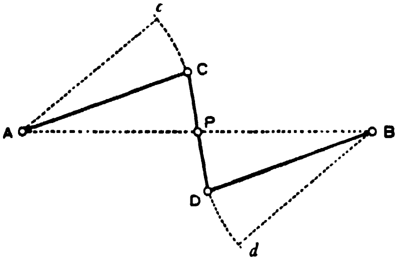
Parallel Motion, a mechanism for constraining a point to move in a straight line. More accurately, but less commonly, this device is termed a *straight-line motion*. The motion produced is proportionate to that given to the mechanism. In the indicator (q.v.) the motions of the piston, which depend upon the steam or gas pressures, are multiplied by such a mechanism. James Watt invented a motion of this type for use in his beam engines. Many of these mechanisms are only straight-line motions within the limited range of their use. Peaucellier's cell or parallel motion consists of seven links, and is one of the few which could be used for extreme travels, as it is a true straight-line motion.



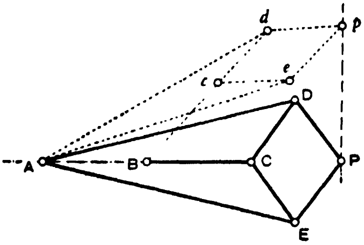
Parallelogram of Forces

OC represents the resultant force in magnitude and direction

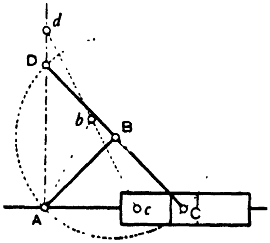
Parallelogram of Forces, an important dynamical principle, deduced by Newton, which may be stated thus: If two forces acting in different directions on a particle at the same time be represented in magnitude and direction by two straight lines meeting at the particle, their resultant effect in giving motion to the particle is that of a force represented in magnitude and direction by the diagonal (terminating in the particle) of the parallelogram, of which the two former lines are two sides.



Watt's Parallel Motion



Peaucellier's Cell



Scott-Russell's Straight-line Motion

Parallel Motions

Paral'ysis, loss of the power of movement, which is caused by injury or disease of the brain, spinal cord, or nerves, or to an affection of the muscular substance itself. When the paralysis is limited to one side of the body, and the voluntary power of moving the muscles is lost, this is usually due to disease of the brain, and receives the specific name of *hemiplegia*. It is generally caused by the bursting of a blood-vessel in the brain; it may also be due to a blood-vessel being blocked by a clot of blood. The paralysis may be sudden and without unconsciousness, or it may be gradual and attended with sickness, faintness, and confusion of mind. In ordinary cases it will be found that one side of the body is powerless, the face twisted, the speech thick and indistinct. Recovery may be complete, or partial, or the attack may prove fatal. In any case the condition is liable to recur after partial or complete recovery. When one side of the body and the opposite side of the face is affected, the disease, which has its seat in the region of the medulla oblongata, receives the name of *crossed paralysis*, and is considered more dangerous than ordinary hemiplegia. When, again, the disease is situated in the spinal cord, the paralysis, which receives the name of *paraplegia*, may affect either the upper or lower part of the body, or motion may be lost on one side and sensation on the other. *Local paralysis* is the term used when disease or injury affects a specific nerve-trunk, and has no connection with disease of the brain or spinal cord. The effect of this local paralysis is to deprive the muscles of their nerve-supply, in which case they lose their power, becoming weak and faint.

Paralysis in Cattle. Cattle at all ages are liable to spinal trouble, resulting in paralysis, temporary or permanent. It most commonly arises in young stock, sometimes in adults, from the presence of bladder worms, such as cause the gid in sheep. The pressure of the growing bladder in the brain may cause fits, sidelong walking, or inability to use one side or one half of the body, the hind extremities being more often affected than the fore-limbs. There is also a dropsical condition of the spinal cord, which causes more or less paralysis, according to the degree of pressure. This overtakes weaklings, and others that have been exposed to hardships of travel by land or sea, and exposure to chilling winds, without exercise.

Where the trouble is due to hydatids or bladder worms, no direct remedies can be applied, but animals often outgrow it if carefully fed, and the bowels kept lax. The bladders attain maximum size, and then gradually shrink if the patient lives long enough. Unsteady gait and difficulty of progression indicate more a hydatid pressure than spinal meningitis. Treatment of paralysis in adults is not likely to be of much avail, unless some brain disturbance is dependent on digestive troubles. For spinal meningitis the whole length of the spine is rubbed with a strong liniment at intervals of two or three days by way of counter-irritation. Turpentine 1 part, ammonia 1 part, and linseed oil 3 parts is suggested. Besides a preliminary purge, a daily dose for a yearling or calf over six months old of 1 drachm of iodide of potassium, 1 drachm of nitrate of potassium, and 20 grains each of powdered nux vomica and sulphate of iron may be given after the first few days. Good, regular feeding and careful management succeed in the majority of cases; and many a staggering calf by this means grows into a good bullock.—Cf. *Standard Cyclopædia of Modern Agriculture* (Gresham Publishing Company).

Paramar'ibo, capital of Dutch Guiana or Surinam, situated at the junction of the Surinam and Commewine Rivers about 10 miles from the sea. It has a commodious fortified harbour, and is the centre of the Dutch West Indian trade, and exports sugar, coffee, cacao, rum, and annatto seeds. Pop. 37,000.

Paramat'ta, or **Parramatta,** a light twilled fabric with a weft of combed merino wool and a cotton warp. It probably takes its name from Paramatta, a town in New South Wales; Paramatta cloths or tweeds made from Australian wools were first made. Fine cloths are now made from Botany and cross-bred wools at Bradford, in Yorkshire, where they are still largely manufactured.

Paraná, the second largest river of South America, draining a larger basin than any other river in the New World except the Amazon and the Mississippi. It is formed by the junction of two streams, the Rio Grande and the Paranahyba, which meet in Brazil, and it discharges itself into the estuary of the La Plata, the latter part of its course being through the Argentine. Its principal tributaries are the Paraguay and the Salado, both from the right. All the tributaries on its left are comparatively short. Its total length is about 2500 miles. In breadth, current, and volume of water the Paraná has ten times the magnitude of the Paraguay, which is itself superior to the greatest European rivers. It is an important water-way to the interior of the country, though with obstructions at certain points. The river was first ascended in 1526 by Sebastian Cabot.

Paraná, a state of Southern Brazil, bounded on the north by the state of São Paulo, on the east by the Atlantic Ocean, on the south by the state of Santa Catharina, and on the west by Paraguay and the province of Matto Grosso. Cotton, rice, yerba-maté, and coffee are cultivated, and lumbering is carried on to some extent. There are numerous German and Polish colonies in the state. Chief town, Curytiba. Area, 93,269 sq. miles; pop. (1920), 674,113.

Paraselene, also called a mock moon, a luminous appearance at a distance from the moon's position in the sky, produced by refractive effects acting upon the moon's rays, in precisely the same manner as parhelia are produced from the solar beams. See *Parhelion*; *Halo.*

Par'asites, the name applied to animals which attach themselves to the exterior (ectoparasites), or inhabit various situations in the interior (endoparasites), of the bodies of other animals, living at their expense. They include such forms as round worms, tape-worms, flukes, fish-lice, bird-lice, and common lice. Plants are also attacked by animal parasites, such as eel-worms. See *Commensalism*.

Parasitic Diseases are those produced by the action of any animal or plant on the human body, and thus include all diseases due to germs, but the term is more generally confined to diseases produced by parasites visible to the naked eye. Examples of these are tape-worm, trichina, guinea-worm, louse, acarus, producing scabies and many others.

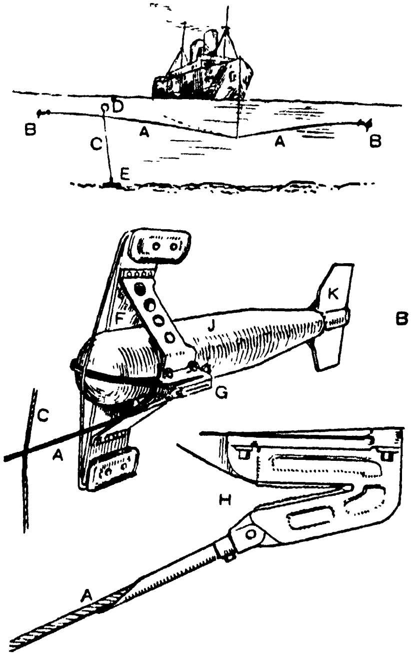
Parasitic Plants, such plants as grow on others, from which they receive their nourishment. In this class are many Fungi, such as the rusts, smuts, and mildews. Among larger parasites are the mistletoe; and the genus Rafflesia, belonging to Sumatra and Java. Parasites are distinguished from *epiphytes*, inasmuch as the latter, though they grow upon other plants, are not nourished by them. See *Epiphyte*.

Paravane, a naval device used during the European War, which secured the immunity of ships steaming at sea from anchored mines. The 'Otter' device was used by over 2700 vessels of the mercantile marine, and a similar system was introduced into the Grand Fleet during 1916. The paravane consisted of a torpedo-shaped body fitted with hydrovanes, at one end of which was a float, and at the other end a weight. There was also a rudder, regulating depth of flotation by means of a hydrostatic valve. A pair of paravanes was towed, one on either beam, by each ship entering a mine-field. On the mooring-chain of a mine coming in contact with the tow-rope, the mine was deflected from the ship, and had naturally to pass the paravane to escape. The nose of the paravane was fitted with a heavy cutter-bracket and serrated knife-blade that, on contact, snapped the mooring-chain, and, by releasing the sinker, allowed the mine to rise to certain destruction by gun-fire. The destructive paravane, of similar construction, was towed in a similar way; but the cylinders were filled with 800 lb. of T.N.T., and were aligned at a depth of 85 fathoms or thereabouts. On encountering a submarine, the charge was exploded by electricity operated from the ship. The device generally proved effective enough, although less so than the depth-charge.

Paray le Monial, a town of France, department of Saône-et-Loire, on the Paris-Lyons Railway. It is a place of pilgrimage, as the holy nun Marie Alacoque (died 1690) is said to have had visions of the Saviour there. Pop. 5000.

Parchim (pȧr'*h*ĕm), a town of Germany, in Mecklenburg-Schwerin, on the Elde. It has manufactures of woollen cloth, flour, oil, paper, and sawmills. It was the birth-place of Count von Moltke. Pop. 10,350.

Parchment (Fr. *parchemin*; Lat. *pergamina*), the skins of sheep, she-goats, and several other animals, so dressed or prepared as to be rendered fit for writing on. This is done by stretching the skin on a frame, separating all the flesh and hair from the skin, reducing its thickness with a sharp instrument, and smoothing the surface with pumice-stone covered with pulverized chalk or slaked lime. After it is reduced to something less than half its original thickness, it is smoothed and slowly dried for use. The name parchment signifies literally paper of Pergamum (Asia Minor), where parchment was first extensively brought into use about 200 B.C., when Eumenes, King of Pergamum, decided to found a library in that city which should rival the famous Alexandrian library. The Jews, however, had books written



Paravane. Type C for Merchant Vessels

A, Wire ropes attached to bow of ship. B, B, Paravanes. C, Wire attaching a mine D to its sinker E. F, Weighted arm to secure steadiness. G, Cutter. H, Enlarged view of cutter. J. The hollow body of the paravane. K, Its tail fins.

on the skins of animals in David's time; and according to Herodotus the Ionians wrote upon goats' and sheep skins. *Vellum* is a finer kind prepared from the skins of calves or kids. Parchment is now chiefly used for writing important legal documents on.

Pardon. In England, in nearly all cases of crimes except where there is an impeachment, a pardon from the Crown may be granted before a trial as well as after; and it stops further progress in the inquiry and prosecution at whatever time it is granted. In cases of impeachment no pardon can now be granted by the Crown while the prosecution is pending; but after conviction of the offender it may be granted, as in other cases. Pardon was formerly granted by the Crown under the great seal, but by 7 and 8 Geo. IV cap. xxviii s. 13 it was made sufficient for the sovereign to issue a warrant for the purpose under his sign-manual, and countersigned by a Secretary of State. The sovereign acts upon the representation of the Home Secretary. In America the Constitution provides that the President "shall have power to grant reprieves and pardons for offences against the United States, except in cases of impeachment". The Senate has the whole power of trying impeachments.

Par'dubitz, a town of Czecho-Slovakia, in Bohemia, at the junction of the Chrudimka with the Elbe. Pop. 20,000.

Paré (pá-rā), Ambroise, French surgeon, born early in the sixteenth century at Laval, died in 1590. He studied in Paris, and for a time acted as an army-surgeon. In 1552 he became surgeon to Henry II, under whose successors (Francis II, Charles IX, and Henry III) he held the same post.

Pareiasaurus, a fossil reptile of primitive type, from Permian strata in South Africa and North Russia. It is one of the Theromorpha (q.v.).

Parent and Child, besides being a natural relationship, has its legal aspects, in which legitimacy and illegitimacy form a clear distinction. All children born in lawful wedlock, or within a satisfactory time afterwards, are considered legitimate; but the common law of England and Ireland does not compel parents to maintain their children. If the parents fail to do so, however, in the case of a child unable to earn its own living, the poor-law authority performs this duty, and by so doing can obtain the power, under an order from a justice of the peace, to compel the parents or other relatives to make a contribution for that purpose. Beyond this there is no legal provision for the maintenance of children by their parents; yet where the child contracts a debt, as for necessary food, clothes, &c., the parents will usually be found liable. Similarly the law does not compel children to maintain their parents, unless the latter become chargeable to the parish. Formerly a parent was not called upon to educate his children, but the elementary education Acts have changed this. When children are legitimate, the common law provides that the father shall be their guardian until their majority; but since 1873 it has been possible for the mother to apply to the court for rights of access and custody while the children are within sixteen years of age. The latter right is usually granted when the father is shown to be a person of immoral character. On the death of the father the mother is now guardian alone or jointly with any guardian appointed by the father or the court. In case of divorce, the court may make regulations as to maintenance, custody, &c. At death parents may, under a proper will, disinherit their children; but in the event of intestacy the children's share of the personal estate is divided equally among them, while real estate falls to the heir. In the case of an illegitimate child, the mother may summon the putative father to appear before a magistrate. When the affiliation charge is proved, the magistrate can order him to pay the lying-in expenses, and a weekly sum not exceeding ten shillings until the child's sixteenth year. He is not, however, in law regarded as the father of the child, and, hence, neither can such a child inherit any of his property, nor is he entitled to the custody of the child.

In Scotland the law upon this question differs in many points from the law in England and Ireland. Thus in Scotland parent and child are legally bound at common law to maintain each other, and this liability may descend after death to the representatives who are *lucrati* (or benefited) by the succession. Although a child is born illegitimate in Scotland, he becomes legitimate should his parents subsequently marry each other, and all his legal rights of inheritance are thus secured, just as if born in wedlock. Another distinction in Scotland is that the father cannot disinherit his child, children being entitled to a share of his personal estate known as *legitim*. In the question of custody the father has the preference, subject to regulation in certain cases by the Court of Session, and upon his decease the law transfers authority to the mother. By the Guardianship of Infants (Scotland) Act (1886), it is provided that the court in pronouncing decree for judicial separation or divorce may declare the offending parent to be a person unfit to have charge of the children of the marriage, even after the death of the other parent. See *Illegitimacy*; *Legitimation*.

Pargetting, or **Parge-work**, a term used for plaster-work of various kinds, but commonly applied to a particular sort of ornamental plaster, with patterns and ornaments raised or indented upon it, much used in the interior and often on the exterior of houses of the Tudor period. Numbers of wooden houses so ornamented on the outside, and belonging to the time of Queen Elizabeth, are still to be met with.

Parhe'lion, or mock sun, an effect produced, but comparatively rarely in our latitudes, from the refraction of the sun's light by minute ice-crystals floating in the higher atmosphere. The halo of 22° radius is much less rare. Sometimes a circle of light is seen passing horizontally through the sun, and right round the sky at the same altitude. Upon this circle, and near to where it intersects the halo, there may appear intensified portions which give practically the appearance of additional suns. These are parhelia or mock suns. Under certain conditions they may also appear in other situations relative to the sun. Instead of sun-like images, there may be patches with prismatic tints—coloured parhelia. In the polar regions especially, circles and bright patches of various positions and sizes may at times be seen simultaneously. These can be explained as due to rays which have entered and traversed the minute hexagonal ice-prisms in different ways, and undergone diverse processes of refraction or reflection.

Pa'riah, a term loosely applied to any of the lowest class of people in Hindustan, who have, properly speaking, no caste. Properly, however, Pariah (a Tamil name) is applied to the members of a somewhat widely spread race in Southern India, generally of the Hindu religion, and though regarded by the Hindus as of the lowest grade, yet superior to some ten other castes in their own country. They are frequently serfs to the agricultural class, or servants to Europeans. The term is figuratively applied to any social outcast. —Cf. H. H. Risley, *The Tribes and Castes of Bengal.*

Pari'ni, Giuseppe, Italian poet and satirist, born in 1729, died in 1799. He studied at Milan, published some youthful poetry, and wrote a brilliant satire on the Milanese aristocracy entitled *Il Giorno* (The Day). From 1773 on he was professor of rhetoric at the Brera, Milan.

Paris, in Greek mythology, also called **Alexander**, the second son of Priam, King of Troy, by Hecuba. His mother dreamed before his birth that she had brought forth a firebrand, which was interpreted to mean that he would cause the destruction of Troy. To prevent this the child was exposed on Mount Ida, where he was discovered by a shepherd, who brought him up as his own son. Here his grace and courage commended him to the favour of Œnone, a nymph of Ida, whom he married. At the marriage of Peleus and Thetis a dispute arose whether Hera, Athena, or Aphroditē was the most beautiful, and as such entitled to the golden apple. Paris was chosen judge, and decided in favour of Aphroditē, who had promised him the fairest woman in the world for his wife. Subsequently he visited Sparta, the residence of Menelaus, who had married Helena (or Helen), the fairest woman of the age, whom he persuaded to elope with him. This led to the siege of Troy, at the capture of which he was killed by an arrow.

Paris, Louis Albert Philippe d'Orleans, Comte de, son of the duc d'Orleans, and grandson of Louis-Philippe, born 1838, died in 1894. After the Revolution of 1848 he resided chiefly in Claremont, England, where he was educated by his mother. He took part in the American Civil War, and on his return to Europe he married his cousin the Princess Marie-Isabelle, eldest daughter of the duc de Montpensier. After the Franco-German War he was admitted a member of the first National Assembly. On the death of the comte de Chambord, the comte de Paris was recognized as head of the Royal House of France, but under the Expulsion Bill of 1886 he was forbidden to enter France. He wrote a *History* of the Civil War in America, and a work on *English Trade Unions.*

Paris, Matthew, an English historian, born about 1195, died 1259. He entered the Benedictine monastery of St. Albans, and in 1235 succeeded Roger of Wendover as chronicler to the monastery. He was very intimate with Henry III, and had a large number of influential friends besides. In 1248 he went on an ecclesiastical mission to Norway. He is characterized as at once a mathematician, poet, orator, theologian, painter, and architect. His principal works are his *Historia Major* (or *Chronica Majora*), written in Latin, and comprising a sketch of the history of the world down to his own times, the latter portion (1235-59) being, however, the only part exclusively his; the *Historia Anglorum*, called also *Historia Minor*, a sort of abridgment of the former; and also lives of the Abbots of St. Albans and of the Kings of Mercia.

Paris (ancient **Lutetia**), the capital of France and of the department of Seine, lies in the Seine Valley (' Paris Basin '), surrounded by Jurassic heights. Through the valley the river runs from east to west, enclosing two islands, upon which part of the city is built. It is navigable by small steamers. The river, which sweeps through the city in a great curve, is crossed by thirty bridges, the more important being Pont Neuf, Pont de la Concorde, Pont Alexandre III, Pont de l'Alma, and Pont d'Iéna. Until after the European War the city was surrounded by a line of fortifications 25 miles long, but they are now being demolished. It is also encircled by the Ceinture Railway. The climate of Paris is temperate and agreeable. The rainiest month is June; the driest, February. The city is divided into twenty numbered arrondissements, at the head of each of which is a *maire* (mayor). Each arrondissement is divided into four quarters, each of which sends a member to the municipal council. At the head are the Prefect of the Seine and the Prefect of the Police. The former is chief of public services; the latter attends chiefly to public safety, traffic, aliens, public morals, law courts, prison services, and the Garde Républicaine. The water-supply of the city is partly derived from the Seine, the Marne, the Vannes, artesian wells, &c.; partly from the Vigne and Aire, by a great aqueduct 63 miles long.

One of the most striking features of Paris is the street-plan, which, as even Paris of to-day, was originated by Napoleon III during the Second Empire, and planned by Baron Haussmann, Prefect of the Seine, the emperors' ablest coadjutor. The broad boulevards are as useful as traffic arteries as they are unique. From south to north the Boulevard St. Michel runs over the Cité and joins the Boulevard de Sébastopol with its extension the Boulevard de Strasbourg. Upon the Place de l'Étoile (Arc de Triomphe) twelve magnificent avenues converge. On the south side is the Boulevard Raspail, joining, towards the riverside, the Boulevard Saint Germain, which curves away to the Pont Sully and merges on the other side with the Boulevard Henri IV. The Grands Boulevards extend, under varying names, from the Madeleine to the Place de la Bastille. Many other streets and avenues are household words throughout Europe.

Squares, Parks, &c.—Among the most notable public squares or *places* is the Place de la Concorde, one of the largest and most beautiful squares in Europe, adorned by fountains and statues, and occupied by the obelisk of Luxor. This obelisk is a monolith of reddish granite from the quarries of *Syene* (Aswan), 76 feet in height and 240 tons in weight. It was erected by Rameses II (Sesostris the Great), King of Egypt, before the temple of Amenhotep III at Thebes (modern *Luxor*), and was intended to honour Ammon Ra, the chief Egyptian deity. In 1830 it was presented to Louis Philippe by Mahomet Ali, Pasha of Egypt, and was placed in position by Lebas in 1836. The Place de la Concorde was so named in 1799; in 1814 it became the Place de Louis XV, and in 1826 Place de Louis XVI. After 1830 it reverted to the old name, and the obelisk was installed there because of a decision to decorate the square with monuments of a non-political nature only. Others are the Place Vendôme, with column to Napoleon I; Place des Victoires, with equestrian statue of Louis XIV; Place de la Bastille, with the column of July; Place de la République, with colossal statue of the Republic; and the Place de l'Étoile, with the Arc de Triomphe, the most imposing triumphal arch in existence. The square is named from the star formed by the twelve radiating boulevards. Napoleon I conceived the project (1806) of erecting four such arches, and completed one in the Place du Carrousel. The Arc de l'Étoile was erected by Louis Philippe (1836). Within the city are situated the gardens of the Tuileries, which are adorned with numerous statues and fountains; the gardens of the Luxembourg, in which are fine conservatories of rare plants; the Jardin des Plantes, in which are the botanical and zoological gardens, hothouses, museums, &c., which have made this scientific institution famous; the Buttes-Chaumont Gardens, in which an extensive old quarry has been turned to good account in enhancing the beauty of the situation; the Parc Monceau; and the Champs Élysées, the last-named being a favourite promenade of all classes. But the most extensive parks are outside the city, such as the Bois de Boulogne and the Bois de Vincennes. The most celebrated and extensive cemetery in Paris is Père la Chaise (106½ acres), named after the Jesuit confessor of Louis XIV, whose country seat occupied the site. It was laid out in 1804, and contains the graves of Sièyes (died 1836), member of the Directory; Laffitte (died 1840), the banker; Macdonald (died 1840), duc de Tarente and Maréchal de France; Kellermann (died 1820), duc de Valmy and Maréchal de France; the Queen of Oude (died 1858); Chopin (died 1849), the pianist and composer; Barras (died 1829), of the Directory; Marshal Ney (shot 1815); Marshal Masséna (died 1817); Marshal Grouchy (died 1847); Alfred de Musset (died 1857); and Rossini (died 1868), the composer; and a host of others whose memories are yet green. The Catacombs are ancient quarries which extend under a portion of the southern part of the city, and in them are deposited the bones removed from old cemeteries now built over.

Churches.—Of the churches of Paris the most celebrated is the cathedral of Notre Dame, situated on the Ile de la Cité. The present edifice was begun in 1163 on the site of a fourth-century foundation, and was consecrated in 1182, although unfinished until the thirteenth century. It contains many valuable treasures, including a fragment and a nail of the original 'true' cross. The church of La Madeleine (or church of St. Mary Magdalene) is an imposing church in the square of the same name. The foundation was laid by Louis XV in 1764. The church of Ste. Geneviève, built about the close of the eighteenth century, was after its completion set apart, under the title of the Panthéon, as the burying-place of illustrious Frenchmen. Ste. Geneviève was buried on the site in A.D. 512, and a church was erected over her tomb. This gave place to a church which was in turn replaced by the present structure. The title Panthéon was originally instituted by decree of the Convention in 1791. Others are: St. Gervais, bombarded by the German long-range gun 'Big Bertha' on Good Friday, 1918; St. Roch; St. Sulpice; Notre Dame de Lorette; St. Vincent de Paul; and St. Germain l'Auxerrois, founded before the time of Charlemagne, the present edifice dating from the fifteenth century. On the very summit of Montmartre is the church of the Sacred Heart, founded in 1874.

Palaces and Public Buildings.—Notable among the public buildings of Paris are its palaces. The Louvre is one of the most important public buildings of Paris, and derives its name from its location on the site of an ancient shooting-box in an afforested region frequented by wolves, and called the *Lupara* or *Louverie*. The modern buildings were founded in 1541 by Francis I, and building was continued by Henri II, Catherine de' Médicis (Francis II and Henri III), and by Henri IV. Louis XIII and Louis XIV both extended the original plans, but their successors (Louis XV and Louis XVI) preferred the Tuileries and Versailles to the Louvre, and abandoned the work. Napoleon conceived the plan of joining the Louvre and the Tuileries by means of a gallery, which was completed as far as the pavilion de Rohan before his downfall, and the grand project was accomplished by Visconti and Lefuel under the guidance of Napoleon III. The combined buildings cover an area of 48 acres, and since 1793 the old Louvre has been used as a museum. The North Palace of the New Louvre is occupied by the Ministry of Finance. In 1871 the Communists burned down that part of the connecting wing nearest the Tuileries, and few architectural details have been preserved. The Palais du Luxembourg, on the south side of the river, has very extensive gardens attached to it, and contains the Musée du Luxembourg, appropriated to the works of modern French artists, with an annexe in the Palais du Jeu de Paume in the Tuileries Gardens. The Palais du Luxembourg originated in the mansion and garden of the duc de Piney-Luxembourg, whose grounds were purchased by Maria de' Médicis, widow of Henri IV, in 1612, and who built the present palace (which is the meeeting-place of the Senate). The Palais Royal is a famed resort. The Palais de l'Élysée, situated in the Rue St. Honoré, with a large garden, is now the residence of the President of the Republic. The Chambre des Députés—known under the Empire as the Palais du Corps Législatif—is the building in which the Deputies meet. The *salons* are held in the Grand Palais des Beaux-Arts, erected for the exhibition of 1900. The Hôtel de Ville is situated in the Place de l'Hôtel de Ville, formerly Place de Grève, on the right bank of the river. Destroyed by the Communists in 1871, it has been re-erected on the same site with even greater magnificence, in the Renaissance style. The Hôtel des Invalides, built in 1670, is used as a retreat for disabled soldiers. The church attached contains the burial-place of the first Napoleon. The Palais de Justice is an irregular mass of buildings occupying the greater part of the western extremity of the Ile de la Cité. Opposite the Palais de Justice is the Tribunal de Commerce. The Exchange (La Bourse) was completed in 1826; it is in the form of a parallelogram, 212 feet by 126 feet, surrounded by a range of sixty-six columns. The extensive markets form a striking feature of Paris, the most important being the Halles Centrales, where fish, poultry, butcher-meat, and garden produce are sold. A notable and unique structure is the Eiffel Tower, built in connection with the exhibition of 1889, on the Champ de Mars, a structure of iron lattice-work 984 feet high, which is used for broadcasting by wireless, and fulfils the function of a gigantic aerial.

Education, Libraries, &c.—The chief institution of higher education is the University of Paris, connected with the Sorbonne. Among Parisian schools the most important are: Descartes (formerly Louis le Grand); St. Louis; Corneille (formerly Collège Henri IV); Charlemagne; Fontanes (formerly Condorcet); de Vanves; the École Polytechnique, for military and civil engineers, &c.; École des Beaux Arts; School of Oriental Languages; Conservatoire des Arts et Métiers; and the Conservatoire de Musique. Of the libraries the most important is the Bibliothèque Nationale, others being those of the Arsenal, Ste. Geneviève, Mazarin, de la Ville, de l'Institut, and de l'Université (the Sorbonne). There are also libraries subsidized by the municipality in all the arrondissements. Among museums, besides the Louvre and the Luxembourg, there may be noted the Musée d'Artillerie, in the Hôtel des Invalides, containing suits of ancient armour, arms, &c.; the Conservatoire des Arts et Métiers; the city historical museum or Musée Carnavalet; the Petit Palais des Beaux-Arts, containing the Dutuit and other collections left to the City of Paris; the Trocadéro Palace, containing ethnographical curiosities, casts of sculpture, &c.; and the Cluny Museum, containing an extensive collection of the products of the art and artistic handicrafts of the Middle Ages.

Theatres.—The theatres of Paris are more numerous than those of any other city in the world. The most important are the Opera House, a gorgeous edifice of great size, built between 1861–75; the Théâtre Français; the Odéon; the Théâtre de la Gaîté, for vaudevilles and melodramas; Théâtre des Folies Dramatiques; Théâtre du Châtelet; Théâtre du Vaudeville; Théâtre des Variétés; Théâtre de la Porte St. Martin; and the Théâtre de l'Ambigu Comique.

Industries and Trade.—The most important manufactures are articles of jewellery and the precious metals, trinkets of various kinds, fine hardware, paper-hangings, saddlery and other articles in leather, cabinet-work, carriages, various articles of dress, silk and woollen tissues (particularly shawls and carpets), Gobelin tapestry, lace, embroidery, artificial flowers, combs, machines, scientific instruments, types, books, engravings, refined sugar, tobacco (a Government monopoly), chemical products, &c. That which is distinctively Parisian is the making of all kinds of small ornamental articles, which are called *articles de Paris*. A large trade is carried on by the Seine both above and below Paris as well as by canals.

Population.—According to approximate estimates the population of Paris was, in 1474, 150,000; under Henri II (1547–59), 210,000; in 1590, 200,000; under Louis XIV (1643–1715), 492,600; in 1856 (before the annexation of the parts beyond the old *mur d'octroi*), 1,174,346; 1861 (after the annexation), 1,667,841; in 1901, 2,714,068; in 1911, 2,888,110; in 1921, 2,906,472.

History.—The first appearance of Paris in history is on the occasion of Cæsar's conquest of Gaul, when the small tribe of the Parisii were found inhabiting the banks of the *Sequana* or Seine, and whose chief town was *Lutetia*, on the modern isle of La Cité. St. Denis suffered martyrdom on Montmartre in or about the year A.D. 250, and Julian resided at Lutetia in 360. The name was then changed to *Parisii*, and the political franchise bestowed upon it. Gratian was defeated and slain at Parisii by Maximus in 383. In the beginning of the fifth century it suffered much from the northern hordes, and ultimately fell into the hands of the Franks, headed by Clovis (son of Childeric, the King of Tournay), who founded the Merovingian dynasty. Pepin became king in 752, and founded the Carlovingian dynasty. In 987 the Capetian dynasty was established in the person of Hugh Capet, from whose reign downwards Paris long continued to be the residence of the Kings of France, and obtained (under St. Louis) many municipal privileges. In 1250 Robert Sorbon, the king's confessor, founded the University of the Sorbonne. In 1483, under Charles VIII, Paris was ravaged by pestilence and famine, and such was the desolation that wolves appeared in herds and prowled about the streets. In the reign of Louis XIV the Paris walls were levelled to the ground after having stood for about 300 years, and what are now the principal boulevards were formed on their site (1670). Only the Bastille was left (till 1789), and in place of the four principal gates of the old walls, four triumphal arches were erected, two of which, the Porte St. Denis and Porte St. Martin, still stand. Many of the finest edifices of Paris were destroyed during the Revolution, but the work of embellishment was resumed by the Directory, and continued by all subsequent Governments. The reign of Napoleon III is specially noteworthy in this respect. Under the emperor's instructions Baron Haussmann opened up new and spacious streets and beautified the city to a great extent. Among modern events in the history of Paris are the siege of the city by the Germans in the war of 1870–1, and the subsequent siege by the French National Government in order to wrest the city from the hands of the Commune. Paris was the scene of international exhibitions in 1855, 1867, 1878, and 1889, but the greatest was that of 1900, which presented an epitome of the progress of the nineteenth century. It was visited by 47,000,000 persons, or about two-thirds more than the number who visited that of 1889. During the European War Paris suffered severely from air-raids, and from 23rd March to 5th Aug., 1918, it was bombarded by long-range guns. The Peace Conferences of 1919 and 1920 were held in Paris.

BIBLIOGRAPHY: E. V. Lucas, *A Wanderer in Paris*; H. Belloc, *Paris*; P. G. Hamerton, *Paris in Old and Present Times*; W. Walton, *Paris from the Earliest Period to the Present Day*; T. Okey, *The Story of Paris*; R. H. Sherard, *Modern Paris*; see also *Histoire générale de la ville de Paris* (published by the municipality).

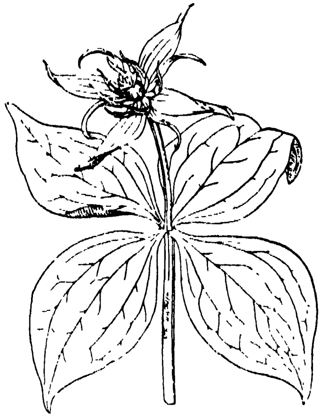
Paris, a city of Texas, United States, the county seat of Lamar county; served by the Texas & Pacific, the St. Louis & San Francisco, and other railways. It is a cotton-trading and manufacturing centre, and has also brick-, furniture-, and woodworking-factories. Paris was founded in 1841, and became a city in 1905. Pop. 15,000.

Paris, a city of Illinois, United States, the county seat of Edgar county; served by the Vandalia and the New York Central Railways, on the latter of which it is an important junction. There is a large trade in agricultural produce. Paris was founded in 1825, and became a city in 1873. Pop. 11,000.

Paris, a genus of plants of the nat. ord. Trilliaceæ. *P. quadrifolia* (herb-paris, true-love, or one-berry) is not uncommon in Britain, being found in moist, shady woods. It has a simple stem bearing a whorl of four ovate leaves near the summit, and a solitary greenish flower. The fruit is a purplish-black berry and the roots are purgative.

Paris, Treaties of. Of the numerous treaties bearing this designation a few only of the most important can be mentioned here. On 10th Feb., 1763, a treaty of peace was signed between

France, Spain, Portugal, and England, in which Canada was ceded to Great Britain. On 6th Feb., 1778, was signed that between France and the United States, in which the independence of the latter country was recognized. A treaty was signed between Napoleon I and the Allies, ratified 11th April, 1814, by which Napoleon was deposed and banished to Elba. The treaty for the conclusion of peace between Russia on the one hand, and France, Sardinia, Austria, Turkey, and Great Britain on the other, at the end of the Crimean War, was ratified 30th March, 1856. The treaty concluded between Germany and the Allies at the end of the European War is officially styled the Treaty of Versailles. It was signed at Versailles, near Paris, on 28th June, 1919.


Herb-paris (*Paris quadrifolia*)

Paris, University of, one of the oldest and largest universities in the world. It came into existence in the beginning of the thirteenth century, and was long the most famous centre of learning in Europe. It was suppressed in 1793 along with the other French universities, a new system being then introduced. It was reorganized by Napoleon in 1808, and was known as the Facultés de Paris until 1896, when it was differently constituted by the law of 10th July. See *France* (*Education*).

Paris Basin, in geology, the great area of Tertiary strata on which Paris is situated. Besides a rich fossil fauna of marine and freshwater mollusca, the remains of mammals are abundant and interesting.

Parish (Gr. *paroikia*, neighbourhood), a district originally marked out as that belonging to one church, and having its spiritual wants under the particular charge of its own minister. Parishes have existed in England for more than a thousand years. According to Camden, England was divided into parishes by Archbishop Honorius about the year 630. But the more probable view is that they were gradually formed at various dates between the seventh and the eleventh centuries. They were originally ecclesiastical divisions, but now, in England especially, a parish is an important subdivision of the country for purposes of local self-government, most of the local rates and taxes being confined within that area, and to a certain extent self-imposed. The importance of the parish has increased since 1894, when an Act was passed by which a *parish council* is established in all rural parishes having a population of 300 or more; the council—a body of from five to fifteen persons elected by popular vote—having various powers, such as the provision of allotments where demanded, the acquisition of land for recreation purposes, the provision of a public water-supply, rights of way, &c. The term of office of a parish councillor is now three years. In all rural parishes there also is a *parish meeting* consisting of registered parochial electors, and the meeting exercises a general control over the parish council and its expenditure, and decides whether certain acts regarding public improvements, lighting and watching, burials, &c., are to be adopted. In Scotland the division into parishes was complete about the beginning of the thirteenth century, and as in England the parish is recognized for certain civil purposes as well as for purposes purely ecclesiastical. Formerly each parish in Scotland had a parish school, and there was a body, the parochial board, which managed the relief of the poor. By an Act passed in 1894 similar to the English Act, there is now a parish council in each of the parishes, having powers similar to those of the English parish councils, and also charged with the relief of the poor, registration of births, deaths, and marriages, &c.

Park, Mungo, British explorer, born near Selkirk, in Scotland, 1771, died 1806. Educated at Edinburgh for the medical profession, he received an appointment as assistant-surgeon on board an East Indiaman and made a voyage to India. Returning to England in 1793, he was engaged by the African Society to trace the course of the Niger. He reached the Gambia at the end of 1795, and, advancing north-eastward, arrived at the Niger near Segu. After exploring part of the course of the river he returned home, and published his *Travels in the Interior of Africa* in 1799. He settled at Peebles as a country doctor, but in 1805 accepted command of a Government expedition to the Niger. Having advanced from Pisania on the Gambia to Sansanding on the Niger, he built a boat at the latter place, with the intention of following the Niger to the sea. It was afterwards ascertained that the expedition advanced down the river as far as Boussa, where it was attacked by the natives. It is supposed that Mungo Park was drowned in his efforts to escape. *The Journal* of his second expedition as far as the Niger was published in 1815.

Park, in a legal sense, a large piece of ground enclosed and privileged for wild beasts of chase, by the monarch's grant, or by prescription. The only distinction between a *chace* and a *park* was, that the latter was enclosed, whereas a chace was always open. The term now commonly means a considerable piece of ornamental ground connected with a gentleman's residence; or an enclosed piece of public ground devoted to recreation, often in or near a large town.

Parker, Sir Hyde, British sailor, born in 1714, entered the navy about 1738, fought against the French and Spaniards, and became vice-admiral. In 1781 he engaged a Dutch fleet off the Dogger Bank without definite result. In 1782 he was lost on his way to take command in the East Indies.

Parker, Sir Hyde, British sailor, son of the preceding, was born 1739, died 1807; distinguished himself in the American and the French War, and in 1801 commanded the fleet which was sent to the Baltic to break up the northern coalition, when Nelson so distinguished himself.

Parker, Joseph, Nonconformist preacher and author, was born at Hexham-on-Tyne in 1830, and died in 1902. In 1853 he became minister of an Independent or Congregational church at Banbury, and five years later removed to Manchester as pastor of Cavendish Chapel. This post he held till his appointment in 1869 to the Poultry Chapel in Holborn, London, which was replaced in 1874 by the City Temple. He was for many years one of the most popular of metropolitan preachers, and was the author of various religious works. His most important literary undertaking was his *People's Bible*, a series of discourses forming a pastoral commentary (25 vols., 1885–95). In 1899 he issued his autobiography, under the title *A Preacher's Life.*

Parker, Matthew, Archbishop of Canterbury, born at Norwich 1504, died 1575. He was the son of a cloth-presser, was educated at Corpus Christi College, Cambridge, and ordained in 1527. In 1535 he became chaplain to Anne Boleyn, in 1537 to Henry VIII, and in 1544 he was appointed master of Corpus Christi College, Cambridge, and elected vice-chancellor of that university the following year. When Queen Mary succeeded to the throne, Parker was deprived of his offices, and remained in concealment until the accession of Elizabeth in 1558. By royal command he was summoned to Lambeth, and appointed Archbishop of Canterbury. It was while he held this office that he had what is known as the Bishops' Bible translated from the text of Cranmer, and published at his own expense. He was the founder of the Antiquarian Society, a collector of manuscripts, which he presented to his college, and editor of the *Chronicles* of Walsingham, Matthew Paris, and Roger of Wendover.

Parker, Theodore, American divine, son of a Massachusetts farmer, born at Lexington 1810, died at Florence 1860. He studied at Harvard University, and in 1837 was settled as a Unitarian preacher at West Roxbury. Although his doctrine was accounted heterodox, yet such was his eloquence and ability that he soon became famous over New England as a preacher and lecturer. In 1843 he visited England, France, Italy, and Germany, and settled as a preacher in Boston on his return. He was a prominent advocate of the abolition of slavery. The principal of his published works are: *Occasional Sermons and Speeches* and *Sermons on Theism, Atheism, and the Popular Theology.*

Parkersburg, a city of West Virginia, United States, the county seat of Wood county, on the Ohio; and served by the Baltimore & Ohio, the Baltimore & Ohio South-Western, and the Little Kanawha Railways; by electric traction to Marietta, Ohio; and by steamboats to river-ports. It is the seat of an Anglican bishop. There are large deposits of oil, coal, natural gas, and fireclay in the vicinity, and Parkersburg is generally an oil-refining and pottery-manufacturing centre. It was settled in 1789, and became a city in 1903. Pop. 20,050.

Parliament, strictly speaking, is composed of the Sovereign and the three Estates of the Realm, viz. the Lords Spiritual, the Lords Temporal, and the Commons; but inasmuch as the Sovereign acts only on the advice of the ministers, Parliament, for all practical purposes, is the legislature composed of the House of Lords and the House of Commons. The House of Lords is the more ancient of the two, but the House of Commons has, by steady evolution, become by far the more important, and has complete control of the nation's purse and power of raising money. The germ of the British Parliament is to be traced to the Witenagemot, the general council or assembly of wise men, of early Saxon times. The name of Parliament was first applied to this council in the time of Edward the Confessor, although it was not a representative body. After the Norman Conquest the Great Council of the Realm, first summoned in 1070, replaced the Witenagemot; it was attended by twelve landed representatives from each county. At first its authority and functions were limited, and in fact became almost nominal. During the reign of Henry II, the first Plantagenet king (1154–89), it was summoned regularly, and in the inclusion of the knights of the shires among the nobles is to be discerned the germ of the Lower House, the Commons. The year 1215 marks a great step. By Magna Charta the Constitution of the Council was more clearly defined, and its powers over taxation were formally recognized for the first time. A distinction was also made between the greater and the lesser barons; while the former were to be summoned personally by special writ, the latter were to be called by a general writ addressed to the sheriffs, a system which may be regarded as the beginnings of popular representation. During the eighty years' conflict over the Charter which followed, Simon de Montfort, by summoning to the Parliament of 1265 two citizens from each town, in addition to the nobles and the knights of the shires, laid the actual foundation of the House of Commons. The term Parliament first appeared in the Statutes of Westminster in 1272. Welsh representatives were added in 1322, and some twenty years later the division took place which developed into the two-chamber system. The official and hereditary elements, i.e. the clergy and the baronage, became an Upper Assembly, while the knights and the burgesses, who met in the old chapel of St. Stephens and elected their first Speaker, Peter de la Mare, in 1377, became known as the Commons. The journals of the two Houses began to be kept and Acts of Parliament printed in 1509. A long struggle between the Sovereign and Parliament began with the Stewart period; it ended in the Revolution of 1688, which drove James II into exile and definitely transferred the principal authority from the monarch to the representatives of the people. Before the end of the seventeenth century, government by party had been introduced by William III choosing his ministers from that section which was stronger in the Commons, and owing to George I being ignorant of English and George II having but an imperfect command of the language, and to the fact, also, that both these kings had little interest in British politics, the Cabinet system, with one of the ministers presiding, became established in the eighteenth century.

The Parliament of Scotland was merged with that of England in 1707, and in 1801 the union with Ireland led to a further enlargement. The House of Commons, however, was a very undemocratic body. Its representation was most unequal; towns like Birmingham and Manchester had no members, and large landowners, members of the House of Lords, owned 'pocket boroughs' for which they nominated representatives. Pitt brought forward a motion for electoral reform in 1785, but it was not until the great Reform Act of 1832 that a change was made. It was rendered imperative by the transformation in English life due to the great growth of industrialism and of the large towns, and to the increase and importance of the middle-classes. The Act of 1832 broke the monopoly of power possessed by the land-owning aristocracy, and altered the centre of gravity in politics by giving the vote to the middle-class. The Reform Act of 1867 extended the franchise, making the town artisan the arbiter, and in 1884 a further Act gave the vote to the unskilled and agricultural labourers. By this time the power of the Commons had become supreme, but serious differences of opinion arose with the House of Lords, mainly over the question of Home Rule for Ireland (q.v.). This eventually led to the passing, in 1911, of the Parliament Act, which completely changed the relations of the two Houses. The Act, which the Lords only accepted with the utmost reluctance on the threat of the creation of a large number of Liberal peers to ensure its passing, deprives the House of Lords of its former power of rejecting a Money Bill, and completely ignores the veto of the Upper House by providing that when a Bill is passed in three successive sessions by the Commons and is rejected by the Lords, it nevertheless becomes law. A further striking advance in democratic government was the passing of the Representation of the People Acts of 1918, which, by granting the franchise to women over the age of thirty, raised the number of electors to more than twenty millions, or nearly half the population, and gave the right to women to sit in the Commons. It also increased the number of members to 707. At present peeresses in their own right are not entitled to sit in the House of Lords, but all parties are committed to a reform of the Upper House, and a more representative Second Chamber, partly elected or nominated, appears to be in sight. At present membership is confined to a certain number of bishops (including the three archbishops), hereditary and new peers, whose number may be unlimited, and to the Law Lords, who are life peers, and are appointed for the purpose of exercising the judicial functions still held by the House of Lords as the final Court of Appeal. A struggle is certain on the question of the powers of the Second Chamber. A feature of the House of Commons to-day is the multiplication of parties and the growth of the Labour Party. The day when the latter will be sufficiently strong to gain a majority and thus become the Government is held to be near, while, on the other hand, the two older great parties, the Conservatives (or Unionists) and Liberals, are splitting into sections. At the moment (1922) there are only two women members of Parliament—Lady Astor, Unionist, and Mrs. Wintringham, Liberal. Each, singularly enough, succeeded her husband, Lady Astor on his elevation to the peerage, and Mrs. Wintringham on becoming a widow. Neither is the first woman elected; that distinction belongs to Countess Markiewicz, who, however, together with the rest of the Sinn Fein members elected in Ireland, has not taken her seat.—BIBLIOGRAPHY: G. B. Smith, *History of the English Parliament*; M. White, *Inner Life of the House of Commons*; J. H. B. Masterman, *The House of Commons: its Place in National History*; A. F. Pollard, *The Evolution of Parliament*; G. L. Dickinson, *The Development of Parliament in the Nineteenth Century*.

Parma, a province of Emilia, North Italy, drained by affluents of the Po, which forms its northernmost boundary. Area, 1258 sq. miles; pop. 340,000.

Parma, a city of Emilia, North Italy, capital of the province of Parma and on the river of that name. It is surrounded in part by a line of ramparts and bastions, and though an old town has quite a modern aspect. Among buildings are the cathedral, built between 1058 and 1106; the baptistery, a structure of marble in the Lombard-Romanesque style (1196–1270); the church of La Steccata; the church of San Giovanni, which, with the cathedral and other churches and buildings, contains paintings by Correggio and Mazzuoli, who were born here; the ducal palace, now the prefecture; the Palazzo dello Pilotta, comprising the museum of antiquities, picture gallery, and library (containing over 300,000 volumes and 5000 manuscripts); and the university, founded in 1482. Parma was originally an Etruscan town, and became a Roman colony in 183 B.C. The manufactures are of silk, cottons, woollens, felt hats, &c. Pop. 54,584.

Parma, Duchy of, formerly an independent state of Upper Italy, but since 1860 incorporated in the Kingdom of Italy, and divided into the provinces of Parma and Piacenza. It comprehended the three duchies of Parma proper, Placentia or Piacenza, and Guastalla, and had an area of about 2266 sq. miles. Parma anciently formed part of Gallia, Cispadana, and Liguria. Charlemagne made a present of it to the Pope; but it subsequently became an independent republic, and in the sixteenth century was erected into a duchy which was long ruled by the Farnese dukes. The victories of the French in Italy in the beginning of last century enabled Napoleon to seize the duchy and attach it to his Kingdom of Italy. After Napoleon's downfall it fell to his widow, the Archduchess Marie Louise, for life, and on her death in 1847 to the Duke of Lucca. The last duke, Robert, was deposed in 1860, and the duchy became part of the Kingdom of Italy.

Parmen'ides (-dēz), Greek philosopher, head of the Eleatic school, native of Elea, in Italy, and flourished about the middle of the fifth century B.C. In 450 he went to Athens, accompanied by his pupil Zeno, and there became acquainted, according to Plato, with Socrates. Like Xenophanes he developed his philosophy in a didactic poem *On Nature*, of which about 160 lines are still extant. One part of this poem dealt with what *is* or 'Truth', and the second part with what only *appears* or 'Opinion'.

Parnahyba (pȧr-nȧ-ē'bȧ), a town and river of Brazil. The river rises in the north-east of the province of Bahia, flows north-east, forms the boundary between the provinces of Piauhy and Maranhão, and falls into the Atlantic below Parnahyba; total course, about 800 miles. The port of Parnahyba admits only small vessels, but has an enormous export of hides, tobacco, cotton, and other produce of Piauhy state. Pop. of town, 12,000.

Parnassians, a school of French poets, deriving its name from the *Parnasse Contemporain*, a collection of poems published in 1866. Another collection appeared in 1869 and in 1876. The ideal of the Parnassians was 'L'Art pour l'art' (Art for Art's sake), a poetic dogma formulated by Théophile Gautier, to which his friend Baudelaire (1821–67) adhered. In 1866 a group of poets in favour of this doctrine foregathered in the house of Leconte de Lisle and composed verses, wherein art was supposed to be cultivated for art's sake, and where personal feeling and anything of a didactic nature was avoided. An offshoot of the Romantic school, the Parnassians aimed at the achievement of perfection in form and thought. To the Parnassians belonged Catulle Mendès, Armand Silvestre, François Coppée, and Sully Prudhomme.

Parnas'sus, or **Liaku'ra**, a mountain of Greece, situated in Phocis, 65 miles north-west of Athens. It has two prominent peaks, one of which was dedicated to the worship of Bacchus, and the other to Apollo and the Muses, while on its southern slope was situated Delphi and the Castalian fount. Its height is 8068 feet, and a magnificent view is obtained from its top.

Parnell, Charles Stewart, Irish Nationalist, born at his father's estate of Avondale, County Wicklow, Ireland, in 1846, died 6th Oct., 1891. He was connected on his father's side with a family that originally belonged to Congleton, Cheshire, and whose members included Parnell the poet, and Sir John Parnell, Chancellor of the Exchequer in Grattan's Parliament; while his mother was the daughter of Commodore Stewart of the United States navy. He was educated at Magdalene College, Cambridge; became member of Parliament for Meath in 1875; organized the 'active' Home Rule party, and developed its obstruction tactics; and in 1879 formally adopted the policy of the newly formed Land League, was an active member of it, and was chosen president of the organization. In 1880 he was returned for the City of Cork, and was chosen as leader of the Irish party. In the session of 1881 he opposed the Crimes Act and the Land Act; was arrested (13th Oct.) under the terms of the former, along with other members of his party; and was lodged in Kilmainham Jail, from whence he was not released until the following May. In 1883 he was the recipient of a large money testimonial (chiefly collected in America), and in this year was active in organizing the newly formed National League. At the general election of 1885 he was re-elected for Cork, and next year he and his followers supported the Home Rule proposals introduced by Gladstone, while he also brought in a Bill for the relief of Irish tenants that was rejected. In 1887 he and other members of his party were accused by *The Times* newspaper of complicity with the crimes and outrages committed in Ireland. To investigate this charge a Commission of three judges was appointed by the Government in 1888, with the result that Parnell was acquitted of all the graver charges. Soon afterwards, however, Parnell was implicated in a divorce scandal. He figured as the co-respondent in an action for divorce brought by Captain O'Shea. In Nov., 1890, the divorce was granted, and Parnell condemned to pay the costs. Gladstone now demanded his retirement from the leadership, and he was denounced by the Irish priesthood. Parnell struggled desperately for his position, but his health broke down, and he died suddenly a year later.—BIBLIOGRAPHY: R. B. O'Brien, *Life of Charles Stewart Parnell*; Viscount Bryce, *Studies in Contemporary Biography*; K. O'Shea, *Charles Stewart Parnell: his Love Story and Political Life*.

Parody, an imitation of a work more or less closely modelled on the original, but so turned as to produce a ridiculous effect. According to the statement of Aristotle in his *Poetics*, the inventor of the parody was one Hegemon of Thasos, who wrote a burlesque *War of the Giants*. Parody, however, is probably far older than this; it is as old as art itself. Hipponax (q.v.) was one of the earliest parodists, and the *Batrachomyomachia*, or Battle of the Frogs and Mice, which dates back to the fifth century B.C., is an amusing though scarcely a brilliant parody of Homer. The parodies written by Aristophanes are unsurpassable. In the *Acharnians*, the *Thesmophoriazusæ*, and the *Frogs* he has parodied Euripides with unerring skill; nor does the last-mentioned play spare Æschylus, though it treats him rather less irreverently. In the hands of Aristophanes the parody becomes not merely an amusing thing, but a vehicle for criticism of the wisest and wittiest kind. Among later Greek writers, Herodas in the second of his *Mimes* caught the exact style of some of the Attic orators, especially that of Hyperides. The heavier-handed Romans did not excel in parody; but there is some to be found in the *Satires* of Persius, and we possess a somewhat puerile parody of Catullus's poem on his yacht, said to be the work of Virgil.

The earliest of great English poets is also the earliest English parodist. Chaucer's *Tale of Sir Thopas* is a first-rate parody of the early metrical romance, and is, in fact, a penetrating criticism upon the literary value of such compositions. Shakespeare did not think parody beneath his notice; witness the First Player's speech in *Hamlet*, ii, 2, which parodies the older school of tragedy. Ben Jonson delighted in the parody, and travestied Daniel and Marston with much success. His parody of Wither's well-known poem *Shall I wasting in despair* is too much a mere verbal echo. Parody took a new lease of life on the appearance of John Philips's *The Splendid Shilling* (1701), which applied the grandeur of Miltonic diction to a ludicrously mean subject. I. H. Browne's *A Pipe of Tobacco* (1736) contained clever parodies of Young, Thomson, Cibber, and others. John Hookham Frere and George Canning contributed many singularly happy parodies to the *Anti-Jacobin* (1797). Southey was often the object of their attentions; but *The Loves of the Triangles* is a faithful parody of Erasmus Darwin's *Loves of the Plants*. The *Rejected Addresses* (1812) of the brothers Horace and James Smith contains many brilliant parodies. Scott, on reading the parody of himself, exclaimed, " I certainly must have written this myself, although I forget upon what occasion ". 'Lewis Carroll' wrote parodies so good as to eclipse entirely the originals. Many who are familiar with Alice's version of *You are old, Father William*, have never heard of Southey's poem *The Old Man's Comforts and how he gained them*. Dr. Watts is treated with equal lack of respect. To parody a bombastic or even a dignified poem is comparatively easy; it is a much harder task to parody a piece of light or comic verse. This has been done with great cleverness by A. C. Hilton, whose *The Vulture and the Husbandman* is as good as *The Walrus and the Carpenter*, and whose *Heathen Pass-ee* is if anything better than Bret Harte's *Heathen Chinee*. The king of modern parodists is C. S. Calverley. His profound classical scholarship helped him to perfection in his art. His translations into Greek and Latin verse may with all possible respect be called parodies of the Greek and Latin poets. His *Carmen Sæculare*, an astounding piece of Latinity, is a more self-conscious parody of the ancients. His parodies of Martin Tupper and Jean Ingelow and, above all, of Browning can be equalled only by the Euripidean parodies in Aristophanes. J. K.

Stephen, an acknowledged follower of Calverley, is sometimes almost as good. His sonnet to Wordsworth contains a just criticism on the dual nature of the work of that poet, and his parodies of Browning and Walt Whitman are felicitous. Tennyson laid himself open to the attacks of parodists, which he did not relish; Calverley travestied him, and Swinburne too was wicked enough to write a poem entitled *The Higher Pantheism in a Nutshell*, which ended with the line:

Fiddle, we know, is diddle; and diddle, we take it, is dee.

W. S. Gilbert in his *Princess Ida* made a " respectful operatic per-version " of *The Princess*. Swinburne excelled as a parodist, and did not spare even himself. His *Nephelidia* is a merciless piece of self-criticism. Among more recent parodists the outstanding name is that of Sir Owen Seaman.

The art of the parodist is not an easy one. Parodies of tedious authors tend to be as tedious as the original, and sometimes the unconscious humour of the original is greater than the conscious fun of the parody. Wordsworth's *Peter Bell* is more amusing than the parodies of Reynolds and Shelley, who had not " a kind of miraculous gift to make it absurder than it was ". The quality which chiefly renders a poem liable to parody is insincerity. A good parody is not a mere verbal echo; it is a form of criticism, and a means of exposing falsities in art.—BIBLIOGRAPHY: W. Jerrold and R. M. Leonard, *A Century of Parody and Imitation*; W. Hamilton, *Parodies of the Works of English and American Authors*; A. Symons, *A Book of Parodies*.

Pa'ros, a mountainous island in the Ægean Sea, belonging to Greece. It is one of the Cyclades, 4 miles west of Naxos; length, 13 miles; breadth, 10 miles. Its marble has been famous from ancient times, and is the material of which some of the most celebrated pieces of statuary are composed. The Arundel marbles, now in the British Museum, were brought to England from Paros in 1667. Paros was the birth-place of the poet Archilochus and the painter Polygnotus. Parikia, a seaport on the north-west coast, is the chief village; pop. 2200. Area, 96 sq. miles; pop. of island, 8000.

Paro'tid Gland, in anatomy, one of the salivary glands, there being two parotids, one on either side of the face, immediately in front of the external ear, and communicating with the mouth by a duct.

Paroti'tis is inflammation of the parotid gland, situated at the back of the cheek between the angle of the jaw and the ear. On account of the tightness of the structures around, any inflammation of the gland is especially painful, owing to the tension produced. Epidemic parotitis is mumps (q.v.).

Parr, Samuel, English scholar, born 1747, died 1825. He was educated at Harrow and Cambridge; taught successively in the grammar schools of Stanhope, Colchester, and Norwich; and in 1783 became perpetual curate of Hatton in Warwickshire. Here he engaged in literature, and became noted among his contemporaries as a classic purist and bitter polemic. His writings are quite impossible to read nowadays. He was a good though somewhat narrow scholar of the old school; but his reputation was largely due to the Whig party, which set him up as a rival to the Tory Dr. Johnson, a man of much greater gifts.

Parr, Thomas, better known as *Old Parr*, was born, it is said, in 1483 at Winnington, Shropshire, and died in 1635, he being then in his 152nd year. A metrical account of his career was published in 1635 by John Taylor the ' water poet ', and he was buried in Westminster Abbey, where a monument records his longevity. His age, however, has been disputed, and doubtless he was not nearly so old as represented.

Parr, a small fish common in the rivers of England and Scotland, at one time believed to be a distinct species of the genus Salmo, but now almost universally regarded as the young of the salmon for the first two years of life, during which they live and feed in fresh water. The term is also applied to the young of any of the Salmonidæ.

Parr (*Salmo salar*)

Parrot, a name common to birds of the family Psittacidæ, of the order Cuculiformes, which also includes cuckoos and plantain-eaters. The bill is hooked and rounded on all sides, and is much used in climbing. The tarsi are generally short and strong, the toes being arranged two forwards and two backwards. The tongue, unlike that of most other birds, is soft and fleshy throughout its whole extent. The wings are of moderate size, but the tail is often elongated, and in some cases assists in climbing. The plumage is generally brilliant. Parrots breed in hollow trees, and subsist on fruits and seeds. Several species can not only imitate the various tones of the human voice, but also exercise in some cases actual conversational powers. Some live to a great age, instances being known of these birds reaching seventy and even ninety years. The species are numerous, and are known under the various names of parrots, parakeets, macaws, lorikeets, lories, and cockatoos (see these articles), the name parrot, when used distinctively, being generally applied to species of some size, that have a strongly hooked upper mandible and a tail short or of medium length. They are natives of both tropical and subtropical regions, and even extend northwards into the United States, and south to the Straits of Magellan, New Zealand, and Tasmania. The best-known species is the Grey Parrot (*Psittăcus erythăcus*) of Western Africa, which can be most easily trained to talk. The Green Parrots (Chrysŏtis) are also common as domestic pets, being brought from the tropical regions of South America. The Carolina parrot (*Conŭrus carolinensis*) is found in the United States, and is gregarious in its habits.

Parrots

1, Grey parrot (*Psittăcus erythăcus*). 2, Lorikeet (*Trichoglossus Novæ-Hollandiæ*). 3, Great black cockatoo (*Microglossus aterrimus*). 4, Grass-parakeet (*Neophema pulchella*).

Parrot-fish, the popular name of spiny-finned fishes included in Scarus and allied genera, family Scaridæ, remarkable for the beak-like plates into which the teeth of either jaw are united, and for their brilliancy of colour, from one or other of which circumstances they have received their popular name. They feed on vegetable matter, corals, and molluscs. Most of the species are tropical, abounding in the neighbourhood of coral-reefs, but one, *S. cretensis*, the *scarus* of the ancients, and esteemed by them the most delicate of all fishes, is found in the Mediterranean.

Parry, Sir William Edward, British explorer, born at Bath 1790, died 1855. He joined the navy in 1808, became lieutenant in 1810, took part in the successful expedition up the Connecticut River in 1818, and continued on the North American station till 1817. In the following year he was appointed commander of the *Alexander* in an expedition to the Arctic regions under Sir John Ross, and during the succeeding nine years he commanded various expeditions on his own account in efforts to find a north-west passage and to reach the north pole. He afterwards filled various Government situations, became rear-admiral of the white, lieutenant-governor of Greenwich Hospital, and received the honour of knighthood. His works include: *Voyages for the North-West Passage* and *Narrative of an Attempt to reach the North Pole in Boats*.

Parsis, or **Parsees′**, the name given in India to the fire-worshipping followers of Zoroaster, chiefly settled in Bombay, Surat, &c., where they are amongst the most successful merchants. After the conquest of Persia by Islam in the eighth century, many Zoroastrians left the country to gain greater religious liberty, and settled in India. They have a great reverence for fire in all its forms, since they find in it the symbol of the good deity Ahurâ-Mazda (Ormuzd). To this divinity they dedicated ‘ fire-temples ’, on whose altar the sacred flame is kept continually burning. Benevolence is the chief practical precept of their religion, and their practice of this finds its evidence in their many charitable institutions. One of the most curious of their customs is in the disposal of their dead. For this they erect what are called *Dakhmas*, or ‘ Towers of Silence ’, built of stone, about 25 feet high, and with a small door to admit the corpse. Inside is a large pit with a raised circular platform round it on which the body is exposed that it may be denuded of flesh by vultures, after which the bones drop through an iron grating into the pit below. In this observance they strictly adhere to the precepts of the *Avesta*. The number of Parsees in India in 1921 was over 100,000.—Cf. J. J. Modi, *The Religious System of the Parsis*.

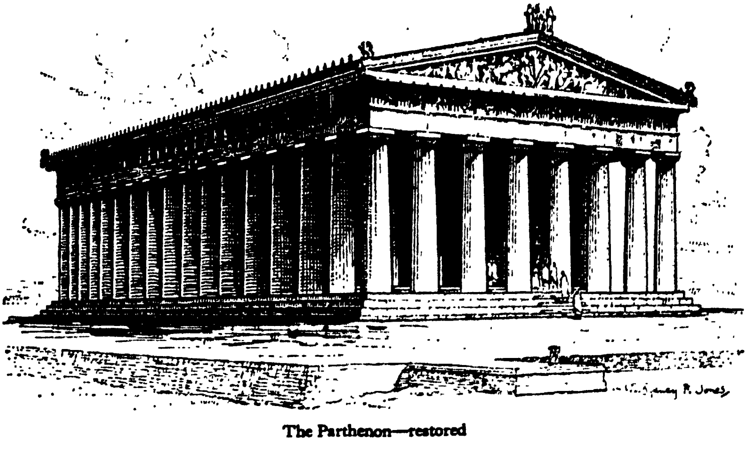
Parsley, a plant of the nat. ord. Umbelliferæ, one species of which, the common parsley (*Petroselīnum satīvum*), is a well-known garden vegetable, used for communicating an aromatic and agreeable flavour to soups and other dishes. It is a native of Sardinia, introduced into Britain about the middle of the sixteenth century. A variety with curled leaflets is generally preferred to that with plain leaflets, as being finer flavoured.

Hamburg parsley is a variety with a large white root shaped like a carrot, for which it is cultivated.

Parsnip, a plant of the genus Pastináca, nat. ord. Umbelliferæ, the *P. sativa* (common or garden parsnip), of which there are many varieties. It is a tall, erect plant, with pinnate leaves and bright-yellow flowers, common throughout England and in most parts of Europe, and much cultivated for its roots, which have been used as an esculent from a very early period. The plants are usually sown in the spring, and the roots, which are at their best in September, are of a sweetish, slightly aromatic taste. They are also cultivated as food for the use of cattle.

Parson, in English ecclesiastical law, is the rector or incumbent of a parish; also, in a wider sense, any one that has a parochial charge or cure of souls. Four requisites are necessary to constitute a parson, viz. holy orders, presentation, institution, and induction. His duties consist chiefly of performing divine service and administering the sacraments.

Partabgarh, a native state of Rájputána, India. The inhabitants are mainly Bhils. Partabgarh, which is connected with Mandasor (20 miles) on the Rájputána Railway, is the capital. State area, 886 sq. miles; pop. (state), 62,000; (town), 10,000.—Partabgarh is also a district in the Fyzabad division of the United Provinces; served by a branch of the Oudh & Rohilkand Railway. Bela is the capital. Area, 1442 sq. miles; pop. (district), 900,000; (town), 9000.



The Parthenon—restored

Parthenogen'esis, in botany, an aberrant mode of reproduction, in which an ovum gives rise to an embryo without previous fertilization; it occurs in dandelion, hawkweeds, lady's mantles, in some ferns, and in *Chara crinita*, but is somewhat rare in the vegetable kingdom. It is a special form of the more general phenomenon of *apogamy*, which includes all cases of aberrant propagation involving the absence of sexual fusion where this should normally occur.

Parthenogen'esis (Gr. *parthenos*, a virgin; *genesis*, birth), in zoology, a term applied to the production of new individuals from virgin females by means of unfertilized ova. We find several examples of this peculiar phenomenon among insects. The most notable are the aphides or plant-lice, whose fertilized ova, deposited in the autumn, lie without apparent development throughout the winter, and in the following spring produce modified females only. These females, without sexual connection, give birth to a second generation like to themselves, and this form of reproduction is indefinitely repeated. In the succeeding autumn, however, male insects appear in the brood, and the ova are again fertilized. The phenomenon is known as *heterogamy*. Another case of parthenogenesis is found in the queen-bee. The eggs which produce neuters or females are impregnated in the usual way, but the eggs which produce the males are not fertilized. Further examples are afforded by flukes, and some of the smaller Crustacea.

Par'thenon (Gr., from *parthenos*, a virgin, i.e. Athena), a celebrated Grecian temple of Athena, on the Acropolis of Athens, one of the finest monuments of ancient architecture. It is built of marble, in the Doric style, and had originally 8 columns on each of the two fronts, with 17 columns on the sides, or 46 in all, of which 32 are still standing; length, 228 feet; breadth, 101 feet; and height to the apex of the pediments, 64 feet; height of columns, 34 feet 3 inches. The pediments were filled with large statues, the metopes adorned with sculptures in relief. After serving as a Christian church and as a mosque, it was rendered useless for any such purpose in 1687 by the explosion of a quantity of gunpowder which the Turks had placed in it during the siege of Athens by the Venetians. Though the more precious pieces of sculpture have been dispersed among various European collections (see *Elgin Marbles*), the Parthenon still bears an imposing aspect.—Cf. A. S. Murray, *The Sculptures of the Parthenon.*

Parthenope'an Republic was the name given to the state into which the Kingdom of Naples was transformed by the French Republicans. After the flight of Ferdinand IV, King of the Two Sicilies, the republic was proclaimed on 23rd Jan., 1799, by orders of the Directory. The name was chosen because in the earliest times the city of Naples was called Parthenope. The republic existed only for five months, for on the 18th June of the same year Cardinal Ruffo, at the head of a mixed body of troops, took possession of Naples, and the republic terminated.

Parthia, in the widest sense, was the Parthian Empire, lying between the Euphrates, the Oxus, the Caspian Sea, and the Arabian Sea. In the narrowest sense Parthia was the small country formerly inhabited by the Parthians, and situated in the north-western part of the modern Persian province of Khorasan. The Parthians were of Scythian origin, fought only on horseback, and were celebrated for their skill in archery. They were subject successively to Persians, Macedonians, and Syrians, and they resisted the Romans with various fortune. The Parthian dynasty, founded by Arsaces (256 B.C.), was succeeded by the Sassanidæ, the latter being founded by Artaxerxes (A.D. 214), a Persian, who conquered all Central Asia. These again were followed by the conquering Mahommedans. See *Persia.*

Partick (ancient **Perdyc**), a district of Glasgow, Scotland, but formerly a separate municipal and police burgh of the parish of Govan, Lanarkshire, separated from Glasgow by the Kelvin. It is an industrial region, and was absorbed by Glasgow in 1912. The flour-mills (the Bunhouse Mills) are supposed to have been presented to the bakers of Glasgow by the Regent Murray as a reward for supplying him with bread at the battle of Langside (1568). Partick is of great antiquity, and had a bishop's palace. Pop. (1921), 53,687.

Partnership is the association of two or more persons for the purpose of undertaking and prosecuting conjointly any business, occupation, or calling; or a voluntary contract, by words or writing, between two or more persons, for joining together their money, goods, labour, skill, or all or any of them, upon an agreement that the gain or loss shall be divided in certain proportions amongst them, depending upon the amount of money, capital, stock, &c., furnished by each partner. Partnership may be constituted by certain acts connected with the undertaking apart from any deed or oral contract. The duration of the partnership may be limited by the contract or agreement, or it may be left indefinite, subject to dissolution by mutual consent. The members of a partnership are called *nominal* when they have not any actual interest in the trade or business, or its profits; but, by allowing their names to be used, hold themselves out to the world as apparently having an interest; *dormant* or *sleeping* when they are merely passive in the firm, in contradistinction to those who are active and conduct the business as principals, and are known as *ostensible* partners. There are now also limited partners. A partnership may be engaged in a particular branch of business, apart from business in which any one partner may embark, but such reservation must be specified in the deed of contract. Each member of a partnership is liable, jointly with the other members, for the debts of the firm contracted during his partnership. A nominal partner may also be liable to anyone who contracts with the partnership on the faith of his name. Each partner is the agent of the partnership, and must account to it for any benefit derived from the use of its property or business connection without the consent of his partners. When the partners in a firm exceed ten where the partnership is for banking purposes, and twenty in other cases, the partnership must be registered as a joint-stock company—with or without limited liability. The law of partnership in England, Scotland, and Ireland was consolidated by an Act of 1890, which did not include joint-stock companies. In Scots law, the partnership is treated as a distinct person. Each partner may sue the firm, and the firm may be made bankrupt without any of the partners being sequestrated. The partners are, however, liable jointly and severally to creditors in payment of its debts. See *Limited Liability Companies.*

Partridge, a well-known game-bird of the pheasant family (Phasianidæ). The common partridge (*Perdix cinerea*) is the most plentiful of all game-birds in Britain, and occurs in nearly all parts of Europe, in North Africa, and in some parts of Western Asia. The wings and tail are short, the tarsi as well as the toes naked, and the tarsi not spurred. The greater part of the plumage is ash-grey finely varied with brown and black. They feed on grain and other seeds, insects and their larvæ and pupæ, and are chiefly found in cultivated grounds. Besides this species there are the red-legged, French, or Guernsey partridge (*Caccabis rufa*), which may now be found in considerable numbers in different parts of England; the Greek partridge (*C. saxatilis*), the African partridge, the Arabian partridge, the Indian partridge. The name partridge is loosely applied in the United States to several North American species of the genus Ortyx or quails, and to some other birds.

Common Partridge (*Perdix cinerea*)

Partridge-berry, a North American plant of the heath family, *Gaultheria procumbens*, also called winter-green. It and *G. shallon*, both with edible berries, are hardy in Britain. Also a North American shrub, *Mitchella repens*, a pretty little trailing plant, with white fragrant flowers and scarlet berries, nat. ord. Rubiaceæ.

Partridge-wood, a very pretty hardwood obtained from the West Indies and Brazil, and much esteemed for cabinet-work. It is generally of a reddish colour, in various shades from light to dark, the shades being mingled in thin streaks. It is said to be yielded by a leguminous tree, *Andira inermis*, and other South American and West Indian trees.

Party-wall is the wall that separates two houses from one another. *Prima facie* such a wall, together with the land upon which it stands, belongs equally to the landlords of the two tenements, who are tenants in common, and are both liable to maintain it.

Pascal, Blaise, French philosopher, mathematician, and theologian, born at Clermont, in Auvergne, 1623, died 1662. In early youth he showed a decided inclination for geometry, and so rapid was his advance that while yet in his sixteenth year he wrote a treatise on conic sections, which received the astonished commendation of Descartes. His studies in languages, logic, physics, and philosophy were pursued with such assiduity that his health was irrecoverably gone in his eighteenth year. In 1647 he invented a calculating machine, and about the same time he made several discoveries concerning the equilibrium of fluids, the weight of the atmosphere, &c. He now came under the influence of the Jansenists—Arnauld and others—and from 1654 he lived much at the monastery of Port Royal, and partly accepted its rigorous rule, though he never actually became a solitaire. He afterwards retired to a country estate, and finally returned to Paris, where he closed a life of almost unbroken ill-health. About 1655 he wrote, in defence of his Jansenist friend Arnauld, his famous *Provincial Letters* (*Lettres écrites par Louis de Montalte à un provincial de ses amis*). Pascal's *Provinciales*, or *Lettres*, are rightly considered a model of the didactic epistolary style in French literature. They are a bitter satire upon the lax morality of the Jesuits, and were immensely popular, but brought down censures, both civil and ecclesiastical, upon the author. His second great work, *Pensées sur la religion et sur quelques autres sujets*, was published posthumously in 1670. It consists of fragments of an unfinished work entitled *Apologie de la religion chrétienne*, and has exercised a considerable influence upon theology.—BIBLIOGRAPHY: J. L. F. Bertrand, *Blaise Pascal*; H. R. Jordan, *Blaise Pascal: a Study in Religious Psychology*; E. Boutroux, *Pascal*; E. Strowski, *Pascal et son temps*.

Pas-de-Calais, a maritime department of Northern France, forming the principal part of pre-Revolutionary Artois, and embracing also a part of Picardy; area, 2550 sq. miles. Its coast, extending about 80 miles, presents a long tract of low sand-hills, but near Boulogne forms a lofty crumbling cliff. The interior is generally flat; the chief rivers are the Scarpe and the Lys; there is a network of canals tapping the coalfields. Arras is the capital; the principal harbours are Boulogne and Calais; other towns are Wimereux, Agincourt, Lens, and St. Omer. The chief mineral is coal. There are numerous iron-foundries, glassworks, potteries, tanneries, bleachworks, mills, and factories of all kinds. It was invaded by the Germans during the European War, and part of it remained in the enemy's possession until the end of 1918. Pop. (1921), 989,967.

Pasha, or **Pacha** (from the Pers. *pad*, protecting, and *shah*, sovereign), in Turkey, an honorary title once bestowed on princes of the blood, but now conferred upon military commanders of high rank and the governors of provinces. It is superior to that of *bey*. There are three grades, and they used to be distinguished by horse-tails waving from a lance, as a distinctive badge. Three horse-tails were allotted to the highest dignitaries; the pashas of two tails were generally the governors of the more important provinces; and the lowest rank, of one tail, was held by minor provincial governors.

Pasht, in Egyptian mythology, a goddess chiefly worshipped in Bubastus, in Lower Egypt, whence her alternative name of *Bubastes*. She was the daughter of the great goddess Isis. She was represented with the head of a cat, the animal sacred to her.

Pasque Flower, the name given to *Anemŏne Pulsatilla*, nat. ord. Ranunculaceæ, a plant with purplish flowers found on the continent of Europe, and so named because its petals are frequently used to dye Easter or *pasque* eggs. The flower blossoms in spring, and its leaves when crushed emit an acrid poisonous juice.

Pas′quinade, a lampoon, 'squib', or piece of satire, usually, but not invariably, affixed to some public place. The term is derived from a statue at Rome named *Pasquino* or *Pasquillus*. Pasquino was a cobbler or schoolmaster of a sarcastic nature who lived in the fifteenth century. When excavating the site of his shop, near the Palace Braschi, a statue of a gladiator was found in 1501, and erected by Cardinal Caraffa. It was named after the sardonic schoolmaster. Poems were attached to it, most of them attacking the Pope and high dignitaries of the Church. A companion statue, *Marforio*, was found in the forum on the Campus Martius; hence the name. Marforio usually asked the questions and Pasquino gave the answers. Both statues are mentioned by Rabelais (book ii, chap. 7) in a part of his book written about 1532. A collection of pasquinades was published in 1544. The practice of writing pasquinades became less common, but there was a great revival of it about 1590. Thomas Nash (q.v.), writing about 1589, first made Pasquin a favourite pseudonym in England.

Passarowitz, a town of Yugo-Slavia, in Serbia, near the Morava River, 37 miles E.S.E. of Belgrade. The Treaty of Passarowitz was concluded on 21st July, 1718, by Venice and the Emperor Charles VI with the Porte. It terminated the war begun in 1714 by the Porte, and in which the Turks gained the Morea in 1715.

Passau (ancient **Castra Batava**), a town of Bavaria, at the junction of the Inn and Danube. The principal building is the cathedral of St. Stephen (1665–80). There is an important trade in timber. The ancient fortress of Oberhaus crowns a precipitous wooded height (426 feet) on the left bank of the Danube opposite Passau. Pop. 21,000.

Passau, the Treaty of, was signed in 1552, when Charles V, intimidated by the victories of Maurice of Saxony, was compelled to do justice to the Protestants, and to grant them full toleration for their religion.

Passchendaele, a ridge and village in Belgium, province of West Flanders, the scene of severe fighting during the European War. Both ridge and village were captured by the Germans in Oct., 1914, and were ultimately regained by the Belgians four years later. See *European War*.

Passenger Pigeon, a bird of the Pigeon family, which abounds in America. It is the *Ectopistes migratorius*, and is distinguished from the common pigeon chiefly by its long graduated tail. It is about 15 inches in length, with finely tinted plumage, small head, and long wings. The multiplication of these pigeons is so rapid, and their destructive power so great, that they are obliged to migrate from place to place in vast flocks to obtain their food. The larger breeding-places are said to cover a forest area of about 40 sq. miles.

Passengers. In law the railway and other public carriers contract to carry passengers without any negligence on their (the carriers') part. In case of accident it lies on the carrier to show that it was from no fault or negligence on his part, or on the part of his servants, that the accident occurred. Hence all passengers injured (or in case of death their nearest relatives) have a claim for compensation, unless it can be proved that the accident was due to the fault of the passenger, or of someone over whom the carrier had no control, or to inevitable accident. Passengers by sea are carried subject to the same general law as those by land: the carriers are bound to observe all due precautions to prevent accident or delay. No emigrant ship having more than 50 steerage passengers or more than 300 persons in all on board, and no other foreign-going ship having more than 100 persons on board, can proceed on its voyage without a duly qualified medical practitioner. In the case of imminent danger from tempest or enemies passengers may be called upon by the master or commander of the ship to lend their assistance for the general safety.

Passifloraceæ, a natural order of polypetalous dicotyledons, comprising some 300 species, natives of warm countries, mostly tendril-climbers. The principal genus is Passiflŏra. See *Passion-flower*.

Passing-bell, the bell that was rung in former times at the hour of a person's death, from the belief that devils lay in wait to afflict the soul the moment when it escaped from the body, and that bells had the power to terrify evil spirits. In the proper sense of the term it has now ceased to be heard, but the tolling of bells at deaths or funerals is still a usage, more particularly as a mark of respect.

Passion-flower (**Passiflŏra**), a large genus of climbing plants belonging to the nat. ord. Passifloraceæ. They are all tendril-climbers, often scrambling over trees to a considerable length, and in many cases are most beautiful objects, on account of their large, rich, or gaily coloured flowers, which are often succeeded by orange-coloured edible fruits, for which indeed they are chiefly valued in the countries where they grow wild. *Passiflōra laurifolia* produces the water-lemon of the West Indies, and *P. maliformis* bears the sweet calabash. The name is applied more especially to *P. cærulĕa*, which is commonly cultivated in England out of doors, and is the one to which the genus owes its name.

Passion-flower (*Passiflōra cærulĕa*)

Passive Resisters, a term applied to those Nonconformists in England and Wales who, being opposed to the Education Acts of 1902 and 1903, refused to pay the education rate, preferring distraint upon their goods to voluntary payment. The movement became widespread, the chief grounds of opposition being the granting of rate-aid to schools giving denominational instruction, and the insufficient representation of the taxpayers in the management of voluntary schools supported out of the rates. Passive resisters have been prominent on various other occasions in English history, examples being the Nonconformist clergymen at the time of the Restoration, and the Nonjurors. The term passive resistance was also applied to the resistance of the Belgians to the German system of government during the European War.

Pas'sover, a feast of the Jews, instituted to commemorate the providential escape of the Hebrews in Egypt, when God, smiting the first-born of the Egyptians, *passed over* the houses of the Israelites, which were marked with the blood of the paschal lamb. It was celebrated on the first full moon of the spring, from the 14th to the 21st of the month Nisan, which was the first month of the sacred year. During the eight days of the feast the Israelites were permitted to eat only unleavened bread, hence the Passover was also called the 'feast of unleavened bread'. Every householder with his family ate on the first evening a lamb killed by the priest, which was served up without breaking the bones. The Passover was the principal Jewish festival. Modern critics regard this festival as having originally no connection with Egypt. It was the feast of spring, and had naturally arisen among a pastoral people. The lamb was an offering of thanksgiving for increase of flocks. Passover was observed by Christ on the night before His crucifixion, when He instituted the Eucharist.

Passport, a warrant of protection and authority to travel, granted to persons moving from place to place, by a competent authority. In most states no foreigner is allowed to travel without a passport from his Government, and in all cases the visitor to the continent of Europe is wiser to provide himself with one, if only as a means of identification. Passports to British subjects are granted at the passport branch of the Foreign Office, London. The commonest procedure is to apply to a good travel bureau for an application form, fill in the particulars required, sign the form, and have it verified by a justice of the peace, minister of religion, banker, or other qualified person named on the form. Unmounted photographs (2½ by 1½ inches or thereabouts) are required in triplicate, and should be attached to the form. The completed document should be returned to the travel bureau, accompanied by the necessary fee (5*s.*), and the application will be put through under their guidance. From four to five clear days' notice should be given. A birth-certificate may be required on occasion, and *visas* are required by the consuls of the countries to which it is proposed to proceed. A fee is usually demanded for a *visa*.

Passy, a western suburb of Paris, in the sixteenth arrondissement and in the neighbourhood of the Bois de Boulogne.

Pasta, Giuditta, operatic singer, born at Como, near Milan, in 1798, of Jewish parents, died 1865. She appeared at first without success, but in 1819–22 her reputation steadily increased, and up till 1833 she held one of the foremost places on the lyric stage, which she then quitted. She was specially distinguished in the tragic opera; Bellini wrote for her his *Norma* and *Sonnambula*, and she made the rôles of Medea, Desdemona, and Semiramide her own.

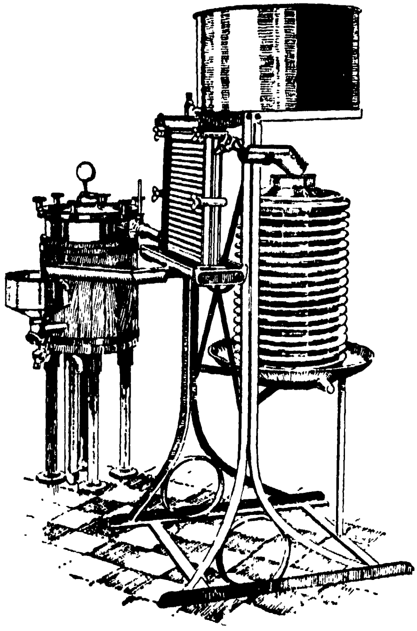
Paste, a composition in which there is just sufficient moisture to soften without liquefying the mass, as the paste made of flour used in cookery. The term is also applied to a highly refractive variety of glass, a composition of pounded rock-crystal melted with alkaline salts, and coloured with metallic oxides: used for making imitation gems. One variety of it is called *Strass*.

Pasteur (pâs-*teur*), Louis, French biological chemist and bacteriologist, born at Dôle, Jura, 27th Dec., 1822, died in Paris 28th Sept., 1895. He was educated chiefly at the École Normale, Paris, where in 1847 he took his degree as doctor. The following year he was appointed professor of physics in Strasbourg, where he devoted much research to the subject of fermentation; in 1857 he received the appointment of dean in the Faculty of Sciences, Lille; in 1863 he became professor of geology, chemistry, and physics at the École des Beaux Arts, Paris; and in 1867 professor of chemistry at the Sorbonne. He became a member of the French Academy in 1882. He was especially successful in proving the part played by microbes in fermentation and decomposition, in introducing a successful treatment of disease in silkworms and cattle, and achieved great success in his efforts to check hydrophobia by means of inoculation. To enable him to deal with this disease under the best conditions a *Pasteur Institute* was opened in Paris on 14th Nov., 1888, where patients are received from all parts of Europe. Pasteur Institutes now exist throughout Europe and in the United States.—Cf. René Valery-Radot, *Life of Pasteur*.

Pasteurization, a process named after Pasteur, the eminent French scientist, whereby the temperature of a liquid is raised sufficiently high to kill off susceptible forms of germ-life. The process may be applied to almost any liquid, but is peculiarly adaptable to cow's milk used for human consumption, and about 80 per cent of all milk consumed in the large cities of Great Britain is pasteurized. Milk may not be 'sterilized' by pasteurizing, and the two terms should not be confused.

Bacteria.—One great advantage of pasteurization lies in the fact that the *tubercle bacilli* it may contain are eliminated. Dr. W. E. Carnegie-Dickson says: "What is known as 'surgical tuberculosis', i.e. tuberculosis of bones and joints and glands, is mostly due to tubercle bacilli derived from milk. . . . In the Royal Hospital for Sick Children, Edinburgh, operations for tuberculosis constitute some 50 per cent of all operations done, . . . and in the post-mortem room, in 80 per cent of a consecutive series of over 600 autopsies, . . . death was directly due to the tubercle bacillus." Important experimental work proves that 60 to 90 per cent of all cases of surgical tuberculosis in children treated are due to infection with the bovine bacillus derived from milk or its products, such as butter, cream, and cheese, which have been manufactured from tuberculous milk. Treated in a careless manner, and exposed to infection at every step from the cow to the consumer, milk will undoubtedly become one of the most dangerous food-stuffs known to mankind. Properly pasteurized and cleanly treated, it may be comparatively pure.

Method.—There are two systems of pasteurization: (*a*) *holding* and (*b*) *flash*; and different modifications of these are adopted to fall into line with local requirements and the purpose for which the 'milk' or cream is required. Where pasteurized milk is required for human consumption, the object is to eliminate non-sporing [1] organisms without effecting any radical changes in its chemical composition.



Complete Pasteurizing Plant

a. Holding.—This method is especially favoured by experts for milk or cream intended for sale. Professor Leitch (Glasgow) favours an exposure to 140° F. for thirty minutes, with a reduction of one minute in the time of exposure for every degree above 140° F. In no case, however, should exposure be for less than ten minutes. Jensen and Plattner do not favour temperatures higher than 140° F., but, generally speaking, a temperature of 158° to 160° F., maintained for half an hour, will eliminate most harmful organisms which exist in milk of average purity.

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[1] Certain germs have the power of forming spores, a dormant or resting form which enables a germ to endure adverse conditions without being 'killed'. In forming spore the protoplasm contracts, and assumes a thick membrane, a spherical or oval body being formed. When the spore-wall is complete, the germ-cell or outer membrane is disrupted, and the germ remains in a highly resistant form, ready to resume its functions of fission (multiplication and reproduction) on the return of normal conditions. Under these circumstances the dangers of drinking old pasteurized milk cannot be over-emphasized. When pasteurized, the milk loses the normal lactic microbes (*Streptococcus lacticus*), and only spores will remain to develop into their full normal lives without such warnings as sourness of smell or taste.

b. Flash.—Where low pasteurizing temperatures are adopted, the process is naturally much longer than where temperatures are high, and at between 160° to 180° F. the exposure is only momentary. This method is very suitable for pasteurizing cream for butter-making. In Denmark, pasteurization to a temperature of 80° C. (176° F.) is compulsory in the case of cream for butter-making, and, as at all temperatures over 160° F., a distinctly cooked flavour is imparted to both cream and fresh butter, although in the latter case the flavour disappears after a few days' storage. During both processes the milk or cream must be agitated continuously, for, when milk is heated, a film of a protective nature is derived from the milk proteids (especially casein) and surrounds the bacteria, retarding, if not entirely preventing, the destruction of non-sporing forms. Thorough agitation is essential to break the film.

Immediately after pasteurization the milk should be cooled to a reasonably low temperature, preferably under 50° F., and should be kept at that temperature. Cooling as much as heating is an essential part of the process of pasteurization. Many kinds of machinery are used, but a simple pasteurizer is an ordinary enamelled pail fitted with a lid and agitator, and held in a boiler or pot of water until the exposure to heat shall have been complete.

Points in Pasteurization: Advantages.—(*a*) Enhanced keeping quality of milk or butter made from pasteurized cream. (*b*) The most harmful non-sporing germs eliminated. (*c*) Food and undesirable taints (including garlic flavour) eliminated. (*d*) Pronounced uniformity both in butter and in milk. (*e*) Pasteurized milk more easily separated by cream separator than raw milk.

Disadvantages.—(*a*) The cream layer is only one-half that of raw milk. (*b*) At high temperatures (much over 160° F.) certain chemical changes occur, i.e. sugar ($C_{12}H_{22}O_{11}$) may be caramelized; viscosity diminished; enzymes weakened and destroyed above 170° F.; digestibility of proteids impaired by partial decomposition; milk appears thin, necessitating thickening with gum-tragacanth or some gelatinous compound; calcium salts and albumen may be precipitated; boiled taste; vitamines entirely destroyed; coagulation if temperature is high enough (i.e. perfectly fresh milk heated at 100° C. for twelve hours, 130° C. for one hour, or 150° C. for three minutes, will coagulate).

BIBLIOGRAPHY: R. H. Leitch, *Butter-making on the Farm* (West of Scotland Agricultural College); Muir and Ritchie, *Bacteriology*; W. E. Carnegie-Dickson, *Bacteriology*; Janet E. Lane-Claypon, *Milk and its Hygienic Relations*.

Pasto, a city of Colombia, South America, capital of the province of Nariño, on an elevated plain (8347 feet altitude) overshadowed by the volcano of Pasto (13,900 feet altitude). It is a bishopric, has a university, and is on the frequented trade routes near the Ecuadorian frontier. There are woollen-factories. Pasto was founded by Pizarro in 1539. Pop. 20,000.

Paston Letters. The correspondence of the Pastons, a family of Norfolk squires, has been, since its first (though incomplete) publication in 1787–9, a most valuable source of English history, and especially of social history, in the fifteenth century. The earliest of the letters was written in 1422 and the latest in 1509, and they relate both to public affairs and to the domestic and business concerns of the Pastons and their patrons, friends, and dependents. Paston is a village about 20 miles from Norwich, and William Paston (1378–1444), a native of the district, who made money as a lawyer in London and became a judge, bought land in Paston and in the neighbourhood. He married an heiress, and his son, John Paston (1421–66), was a considerable landowner. He was also a lawyer, and many of the most interesting letters were addressed to him by his wife, who reported the progress of family affairs and the gossip of the time. The Wars of the Roses imperilled the safety of the Paston property, and in 1459 John Paston was left a large amount of land, including the castle of Caister, by Sir John Fastolf. The will was disputed, not only by legal means, and a petty civil war was waged between the Pastons and the Dukes of Norfolk. The struggle continued through the lifetime of John Paston and his eldest son, Sir John Paston (1442–79), until in 1474 a compromise was arranged. In the course of these years the castle was taken and re-taken several times. The letters throw a vivid light upon the lawless condition of England in the end of the reign of Henry VI and the beginning of that of Edward IV. Sir John Paston was succeeded by his brother, also called John, who died in 1503, shortly before the series of letters closes. The correspondence is most important for about thirty years after 1445, not only for public events, but also for manners and customs. By some fortunate accident the letters were preserved, and the last descendant of the family, William Paston, second Earl of Yarmouth, sold most of them to Le Neve, an antiquary of the early eighteenth century. After the publication of four volumes in 1787–9 by John Fenn, and a fifth in 1823, the originals were lost, and their authenticity was questioned, but a large number of the originals have been recovered, together with manuscripts not included in the Yarmouth sale. A complete edition was published by the late James Gairdner in 1904.

Pastor, a genus of birds belong to the starling family, found in the north of Africa, Syria, and India. The rose-coloured pastor (*P. roseus*) is the only European specimen, and, being a good singer, is a favourite cage-bird.

Pastoral, a branch of literature which deals, in a more or less direct form, with rustic life. The pastoral is a striking example of how the genius of one man influenced literature for over two thousand years. Theocritus, a native of Syracuse, was the originator of pastoral poetry. His poems, which are for the most part very beautiful, have a certain amount of realism in them, and describe something not very different from the life of Sicilian shepherds in the third century B.C. His two successors, Bion and Moschus, are celebrated chiefly for their laments; Bion wrote a *Lament for Adonis* and Moschus a *Lament for Bion*. Theocritus was imitated and transplanted to Italy by Virgil, a much greater poet and artist, who nevertheless failed to retain some of the charm of the Greek. Virgil's *Eclogues* are the least mature of his poems, but they show many examples of the consummate finish which he could give to his lines. They had great influence upon pastoral poetry, as had his much more mature *Georgics*, which, though not strictly speaking pastorals, are a glorification of rustic life. Calpurnius Siculus and Nemesianus were direct followers of Virgil, and minor poets of some charm, but the influence of the *Eclogues* is seen in the works of many writers of poetry of all kinds. After the revival of learning the pastoral became an important branch of literature, and it would not be possible to mention all the poets who attempted to write it. In Italy Petrarch and Boccaccio both wrote pastorals; Sannazaro's *Arcadia*, Tasso's *Aminta*, and Guarini's *Pastor Fido* were immensely admired and frequently imitated. Baptista Spagnuoli Mantuanus (mentioned by Shakespeare in *Love's Labour's Lost*) wrote twelve frigid eclogues which won great renown mainly owing to their excellent moral tone. In France Marot was the chief exponent of the new fashion. The late Greek novelist Longus, who wrote *Daphnis and Chloe*, made the pastoral romance fashionable, and so was responsible indirectly for Sidney's *Arcadia*. In Spain Montemayor and Cervantes both wrote pastorals, though the latter made fun of the whole bucolic convention in *Don Quixote*. Pastoral poetry in England owed much of its vogue to Spenser, whose *Shepheard's Calender* is one of the greatest English pastorals. The popularity of the pastoral was also due not a little to the book which sixteenth and seventeenth century Englishmen knew and reverenced above all others. The Bible, with its idyllic representation of pastoral life in the Old Testament, and its description of Christ as the Good Shepherd in the New Testament, made the pastoral a more serious form of writing than it would otherwise have been. Moreover, the easy identification of pastor, a shepherd, with pastor in its ecclesiastical sense made the pastoral a convenient form for covert satire upon the Church.

The pastoral invaded English drama at its greatest period. Some foreshadowing of this may be seen in the miracle-play known as the *Wakefield Second Shepherds' Play* (one of the Towneley plays), where the Biblical shepherds have come alive in a pleasing and unexpected fashion. Fletcher's *Faithful Shepherdess* is an imitation of Guarini's masterpiece, and a delightful play. Ben Jonson's beautiful un-Jonsonian fragment *The Sad Shepherd* is a wonderfully fresh and captivating play, which introduces Robin Hood and his merry men in Sherwood. Randolph's *Amyntas* is a play of some charm, and proves the versatility of its author. Shakespeare has set the stamp of his genius upon the pastoral in *As You Like It*, and in his final period, when he was "On the Heights" as Dowden so aptly expressed it, he returned to the pastoral in *The Winter's Tale*. In the shepherd scenes of this play the pastoral reaches its greatest height. Among writers of pastoral poetry, as distinct from pastoral drama, may be mentioned Drayton, Browne, Wither, Herrick, and Milton. During the Great Rebellion and after the Restoration pastoral poetry became extinct, but it enjoyed a kind of revival in the early eighteenth century. Pope and Ambrose Philips produced highly artificial eclogues, and the former wrote a paper to *The Guardian* (No. 40) in which he expounded, more or less ironically, his views upon pastoral poetry. Gay's *Shepherd's Week* was originally intended to pour ridicule upon the pastoral, but the author's real poetical gifts were too strong for him, and forced him to write a series of realistic and genuine poems. Ramsay's *Gentle Shepherd* (1725) was the last bucolic drama produced in Britain. The dirge-element, which was so strong a feature in the poems of Bion and Moschus, was anglicized by Milton in *Lycidas*, and has influenced such poems as Shelley's *Adonais* and Arnold's *Thyrsis*. Except in such poems as these, the pastoral has not survived, save as an element in burlesque. Swift had suggested to Gay that he should write a Newgate pastoral, but Gay wrote instead *The Beggar's Opera*. Samuel Butler the Second wrote a stock-exchange oratorio buffo called *Narcissus*, which is a kind of pastoral. Gilbert's *Iolanthe* introduces Strephon, an Arcadian shepherd, who is a fairy down to the waist, and Phyllis, an Arcadian shepherdess and ward in Chancery.

Except in the hands of the greatest masters, the pastoral has been an artificial and conventional species of literature. It has as a rule been written by town-dwellers for town-dwellers. It is sometimes ridiculous; the pastoral convention was seen at its most absurd when Marie Antoinette played at being a shepherdess in the gardens of Trianon, while outside the French Revolution was coming to a head. At its worst, however, the pastoral has given us some silly but innocuous verse; at its best it has given us Theocritus, Virgil, *The Winter's Tale*, and *Lycidas*.—BIBLIOGRAPHY: W. W. Greg, *Pastoral Poetry and Pastoral Drama*; E. K. Chambers, *English Pastorals*.

Pata'gium is the name applied to the expansion of the skin by means of which bats fly, and such forms as flying squirrels, flying lizards, &c., support themselves in the air, as by a parachute.

Patago'nia, a name which has no political significance, and is applied to the region lying east of the Andes and south of the Rio Negro. Formerly it was applied to the whole portion of South America extending north from the Straits of Magellan. It is divided between Chile and Argentina. The Straits of Magellan separate the mainland from the innumerable islands of Tierra del Fuego. On the straits is the Chilian seaport of Punta Arenas, one of the most southerly towns in the world. Patagonia east of the Andes consists mainly of vast undulating plains, frequently covered with shingle and broken up by ridges of rock. The vegetation is scanty, except in the region adjoining the Andes, and in many places there are shallow salt-lakes and lagoons. The chief rivers are the Rio Negro, the Chupat, the Rio Desire, and the Rio Chico, all of which have their sources in the Andes and run eastward. There are few, if any, good seaports. The native Patagonians are nearly extinct. They are a tall, muscular race averaging never less than 6 feet in height, with black hair, thick lips, and skin of a dark-brown colour. They are a nomad race, whose chief occupation is in hunting and cattle-breeding, and are remarkable swimmers. In various parts white settlers have taken up land, and many sheep and cattle are reared even far south. The country was discovered by Magellan in 1520.

Pataliputra, an ancient city of India, the *Palibothra* of Megasthenes, the Greek historian, Strabo, Pliny, and others. It was the capital of the Nanda dynasty and of the Maurya dynasty, which was founded by Chandragupta, and which succeeded the Nanda as rulers of Magadha. It was to the court of Chandragupta (Sandracottus) that Megasthenes was accredited as ambassador from Seleucus Nicator about the year 300 B.C. Megasthenes, whose account is preserved by Arrian, says: "The capital city of India is Palibothra, in the confines of the Prasii, near the confluence of the two great rivers Erannoboas and Ganges. Erannoboas is reckoned the third river throughout all India, and is inferior to none but the Indus and the Ganges, into the last of which it discharges its waters." According to the Vayu-Purana, the city of Kusu-Mapura or Pataliputra was founded by Raja Udayaswa, the grandson of Ajatasatru, the contemporary of Buddha. According to Buddhist tradition, where Buddha crossed the Ganges on his last journey from Rajagriha to Vaisalis, the two ministers of Ajatasatru, King of Magadha, were engaged in building a fort at the village of Patali, as a check upon the Wajji or people of Vriji. Buddha then predicted it would become a great city. Diodorus attributes the foundation of the city to Heracles, meaning Bala-Rama, the brother of Krishna. Probably, then, the building of the city had been completed by 450 B.C. Eventually it was deserted for Rajagriha or Bihar, and a Chinese missionary who visited the place in A.D. 640 states that Pataliputra was a mass of ruins when he saw it. Dowson was the first to expound the theory of Pataliputra and modern Patna being coextensive. See *Patna*.

Patchou'li, a perfume obtained from the dried leaves and branches of the *Pogostĕmon patchouli*, a labiate plant of India and China. It is used in India to scent costly Kashmir shawls, tobacco, and hair-oil, and is also valued as a preservative of woollens and linens from insects.

Patel'la, the name applied in anatomy to the 'knee-cap' or 'knee-pan', the sesamoid bone of the knee.—The name is also applied to a genus of gasteropodous molluscs comprising the limpets.

Pat'en (Lat. *patina*, a small dish), an ecclesiastical term applied to the round metallic plate on which the bread is placed in the Lord's Supper. It often serves as a cover for the chalice. In ancient times the paten was of considerable size, and was often made of wood or glass. As the Church grew more wealthy patens were made of gold or silver.

Pa'tent, a privilege from the Crown, granted by 'letters patent' (whence the name), conveying to the individual or individuals specified therein the sole right to make, use, or dispose of some new invention or discovery for a certain limited period, which in the United Kingdom may run to sixteen (formerly fourteen) years, or even longer should the inventor be able to prove that the invention, though of great public utility, has been up till that time almost unprofitable to him. Patents are obtained directly from the Comptroller-General of Patents at the Patent Office, London. The person applying must furnish either a provisional specification, giving a general account of the nature of the article or invention he wishes to be patented, or a complete specification, particularly describing the nature and working of the invention and containing a statement of claim. The application and specification are submitted to an examiner connected with the Patent Office, and if he report that everything is satisfactory and done in due form, the invention properly described, &c., the application is accepted; otherwise the party may have to make amendments in his application and specification. Appeal may be made from the Comptroller to a law officer of the Crown, who decides the matter. When the application for a patent is accepted by the Comptroller-General, and has not been accompanied by a complete specification, the applicant must furnish a complete specification within nine months (which, on payment of a fee, may be extended by one month) from the date of his application. This is also officially examined, and if approved is printed and published, but the patent is not granted till after two months, within which time any person may oppose the grant on sufficient grounds shown, such as that the invention is not new, that it does not belong to the applicant, &c. Here again the law officer may have to give his decision. When a complete specification has been presented, there is now an official investigation of the specifications of British patents for not more than fifty years back, to discover whether the invention claimed has been anticipated either wholly or in part, and thus serve as a guide to would-be patentees. If such anticipation is proved, the applicant has the opportunity to amend his specification within such time as may be prescribed, and failing such amendment reference to prior specifications may be made by the Comptroller in the specification in question by way of notice to the public. In order to prevent the almost entire manufacture abroad of articles patented in the United Kingdom, any person may, not less than four years after the date of the patent, apply for its revocation on the ground that the patented article or process is manufactured or carried on exclusively or mainly outwith the United Kingdom without satisfactory reason. The fees for procuring a patent and keeping it in force are spread over the full period of sixteen years. The fees for sealing the patent amount to £5, and at the end of four years renewal fees must be paid every year, such fees amounting to £5 for the fifth year, £6 for the sixth, and so on until the sixteenth year, when the fee is £16; in default of such payment the patent will lapse. The applications for patents in the United Kingdom for 1920 numbered 36,672. Patents are usually taken out through professional patent agents, who have to be registered by the Board of Trade. When the rights of a patentee are being infringed, he can protect them by a civil process at law, and his suit will be upheld if he can prove that the main elements of his invention have been infringed, but he cannot recover damages from an innocent infringer reasonably unaware of the patent. A patent once granted can be revoked if it can be shown that the patentee is not the inventor. The patent laws vary considerably in foreign countries and the British Dominions. Arrangements may be made with the Governments of foreign states and British possessions for the mutual protection of inventions. An applicant in such foreign state or British possession is entitled to a patent in the United Kingdom if applied for within twelve months of his application in his own country. An illustrated official journal of patented inventions, reports of patent cases decided by courts of law, and printed specifications of all patents, are issued by the Patent Office, in London, from which the current rules, regulations, &c., may be obtained at small cost. There are also an extensive Patent Library and Museum freely open to the public.

Patent Medicines are medicinal preparations made by various individuals, companies, and corporations, and sold by them under distinctive names. The term is nowadays practically synonymous with *proprietary medicines*, for the true patent medicines, whose composition and modes of preparation are described when a patent is being obtained, are for the most part definite chemical substances for use in medicine. Aspirin and antipyrine were at one time patent medicines in this sense. In the majority of cases the proprietor or inventor of a medicinal preparation does not apply for protection under the patent laws, but registers the name thereof under the trade-marks Acts, for he depends chiefly on advertisements in the press or otherwise to bring his preparation into common use. As the element of ownership is the chief factor in these cases, they are known as proprietary medicines. These are divisible into two groups, viz. (1) those in which the composition is stated on the package, wrapper, or container, or a reference given to a well-known book of 'known, admitted, and approved remedies' recognized by the Board of Customs and Excise; (2) those in which the composition is not stated. The first group contains a large number of preparations in demand by the public and the medical profession, being in fact ready-made prescriptions, and have only one objection against them, i.e. the 'art of prescribing' is apt to suffer by their use. The second group also contains a number of preparations, as purgative pills, in great public demand, to which no serious objection is taken by medical practitioners; but just because they are 'secret remedies' serious abuses have crept in. On analysis many of these remedies have been shown to be of no medicinal value whatever, while the cost of the materials has been so low as to be negligible; yet the most extravagant claims as to their curative powers have been made, and the less curable the disease they are declared to alleviate or cure (e.g. cancer or phthisis) the louder and more aggressive the vendors of these remedies become.

Medicine stamp duty is payable on all patent or proprietary medicines belonging to group (2) of the foregoing classification. It varies with the selling price, being threepence when that is one shilling or under, sixpence when half a crown or under, and so on, being twice the pre-war duty. In virtue of this duty a licence for the sale of those medicines must be obtained from the Board of Customs and Excise.

Pater, Walter, British essayist and critic, born in London in 1839, died at Oxford in 1894. Educated at King's School, Canterbury, and Queen's College, Oxford, he was elected to a fellowship at Brasenose College, and his life was chiefly spent in retirement at Oxford. His works are not numerous, but they are all characterized by careful construction, accurate and wide knowledge, and a fastidiously exact, though at times over-elaborated style. They comprise: *The Renaissance: Studies in Art and Literature* (1873), a series of detached essays; *Marius the Epicurean: his Sensations and Ideas* (1885); *Imaginary Portraits* (1887); *Appreciations* (1889) (of Wordsworth, Coleridge, Lamb, Sir Thomas Browne, Rossetti, &c.), with an *Essay on Style*; and *Plato and Platonism*, a series of lectures (1893). Besides these there were published posthumously *Greek Studies* (1895); *Miscellaneous Studies* (1895); and *Gaston de Latour*, an unfinished romance (1896).

Pat'era, a shallow, circular, saucer-like vessel used by the Greeks and Romans in their sacrifices and libations. The name is applied in architecture to the representation of a flat, round dish in bas-relief, used as an ornament in friezes, &c., but many flat ornaments are now called pateras which have no resemblance to dishes. The term is also inappropriately applied to the variously shaped flat ornaments frequently used in the perpendicular style of Gothic.

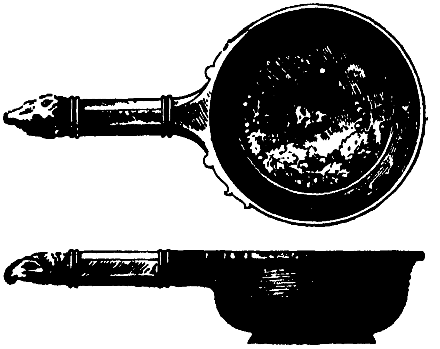
Pater'culus, Gaius Velleius, an ancient Roman historian, born about 19 B.C., died about A.D. 31. He served under Tiberius in Germany as commander of the cavalry, and in the first year of that emperor's reign was nominated prætor. Nothing further is known of him except that he composed a compendium of Roman history to the year A.D. 30 in two books, of which the beginning and a portion following the eighth chapter of the first book are wanting.

Pater'nians, a heretical sect of the fifth century, followers of *Paternus*, who are said to have held that God made the nobler parts of man and Satan the lower. Hence they served God with the former parts and the devil with the latter.

Paterno (ancient Hybla Galeatis, or Hybla Minor), a town of Sicily, in the province of Catania, at the foot of Mount Etna. In the vicinity are mineral-springs and the remains of baths and ancient bridges. Pop. 29,000.

Paterson, William, financier and founder of the Bank of England, was born in Dumfriesshire 1665, died in London 1719. He went through England as a pedlar, settled for a time at Bristol, and subsequently resided in the Bahama Islands. In 1694 he founded the Bank of England, being one of its first directors. Before this time he had conceived the project of founding a free emporium of trade in Darien, and in 1695 he obtained the sanction of a Scottish Act of Parliament constituting the Darien Company. After the failure of this great scheme he returned to England, broken in health and fortune. When the Treaty of Union between England and Scotland was concluded in 1707, Paterson, who was one of its warmest advocates, after much difficulty received an indemnity (of £18,000) for the losses he had sustained. He was a great financial genius, but most of his views (such as his advocacy of free-trade) were far in advance of his time.—Cf. Bannister, *Life of W. Paterson.*

Paterson, a city of New Jersey, United States, the county seat of Passaic county, on the Passaic River; served by the Delaware, Lackawanna, & Western, the Erie, and the New York, Susquehanna, & Western Railways, and by electric traction lines. It is a great manufacturing centre, and the home of the silk industry of the United



Roman Patera

States. Hydro-electric power is provided by the river, which falls 70 feet (50 feet perpendicularly) at this point. Paterson was founded in 1791, and became a city in 1851. Pop. (1920), 135,866.

Pathans (patän), the generic name by which the Mahommedan people living on and beyond the north-west frontier of India are known. As used now, the name Pathan is made to include all Pushtu-speaking tribes, and thus takes in the Afghan; but the real Pathan is probably an aborigine, whose ancestors were settled in the same inhospitable tracts of country the tribes now occupy, centuries before the arrival of the people whom we know as Afghans. The Pathans proper are divided into large tribes, each of which in its turn is again split up into clans or khels. Its principal big tribes are the Yusufzais (Yusuf = Joseph), Khattaks, Mohmands, Afridis, Wazirs, and Mahsuds. The first two of these tribes live mainly in the British administrative territory, while the other four have their being beyond the border, and are independent. Each tribe differs from the others in many respects, each having its own peculiar customs and dialect of Pushtu. But there is one point in which all are alike: they are all truculent to a degree, and are continually fighting among themselves. Fighting is their very existence, the be-all and end-all of their life. To a certain extent the nature of this country, composed as it is of barren, inhospitable hills, is partly responsible for this, for, seeing that the country can produce next to nothing, the Pathan has to rely for his sustenance on what he can take from others. Consequently, raids into the settled and cultivated country over the border are the natural results. But the orthodox Pathan does not confine his activities to robbing and murdering sleek Hindu traders in the bazaars of Peshawur. The blood-lust will out, and when a commercial raid is out of the question, our Pathan will turn to his friends and relations in order to find a target for his gun or meat for his knife.

Two men from different clans were once discussing the respective heights of two hills, one being in A territory and one in B. Each claimed the honours for the hill in his own territory, and, being unable to agree and not knowing, of course, how to measure the heights, drew their knives and set upon each other. The fight resulted in the death of one man, *and* a blood-feud between the two clans, which exists to the present day, though the episode took place an unknown number of years ago. Some ten years ago, one man snatched the cap off the head of another, and, in the words of the Pathan who told the writer the story, " the result was terrible, six murders on the spot, besides a few wounded, and all in fifteen minutes ".

The ' offensive spirit ' is inculcated into Pathan youths by pitting them against inferior foes selected from the animal kingdom, in order to fit them by a system of graduated steps to take on one of their friends or near relations. A boy of eight, armed with a stick, has to defeat and kill an infuriated snake or a mongoose (a large, ferret-like animal). In due course he deals with a porcupine, and finally with a specially trained fighting ram, and, after a successful interview with this, is permitted to carry a knife, and murder his own kind.

This sort of training, combined with the hard life that is a necessary corollary to the nature of this country, makes the Pathan a hardy and fearless soldier. They are also much addicted to sports of all kinds, especially hunting, tent-pegging, archery, and cock-, bull-, dog-, and ram-fighting. Small-bore rifles are worth their weight in silver across the border, so that regiments on the frontier have to keep a particularly sharp look-out against rifle thieves.

Pathans are enlisted in considerable numbers into the frontier force regiments of the Indian army. They fight loyally for us when in the army, and with just as much gusto against us when they return to ' civil ' life after their period of service has expired. The frontier militias and khassadars (levies) are entirely composed of local Pathans.

Pathol'ogy deals with departures from the normal state of the body and the causes underlying such changes. Therefore the foundations of the science of pathology are physiology and anatomy. Owing to its structure the body does work, which may be mechanical, e.g. muscular contraction, or chemical, e.g. secretion of saliva or gastric juice. Further, the wear and tear of the tissues is repaired, and at certain periods growth of the whole body or of certain organs occurs. Accordingly, pathology is concerned with alterations in structure or function. Structural changes are comprised in *pathological anatomy*; such alterations may be relatively gross and readily recognizable by the unaided eye, or they may require high magnifications of the microscope for their detection. A true understanding of structural changes was first rendered possible by the discovery that cells constitute the essential elements of which the bodies of higher animals are composed, and the doctrine enunciated by Virchow that every cell is derived from a pre-existing cell (' omnis cellula e cellula ') has been universally accepted. Chemical pathology deals with aberrations in the composition of the cells and their products. Closely related to this department is the investigation of physical or physico-chemical changes; since living protoplasm consists of materials in the colloid state, such alterations are likely to have far-reaching consequences. Knowledge of these branches of pathology is of more recent growth than that of pathological anatomy, and great advances may be expected along these lines. A striking instance of disease with a physico-chemical basis is hæmophilia; in this condition slight injuries lead to severe and long-continued loss of blood, yet no anatomical abnormality can be found in the blood-vessels or other tissues. In diabetes, also, a disease in which the body fails to utilize sugar, no anatomical lesion is constantly found. *Etiology* is the branch of pathology which is concerned with the causes of disease. These most frequently are *external*; thus it is a general principle that the body from the fœtal stage until adult life exhibits structures and functions which, in the absence of external disturbance, are extremely constant, and which, therefore, are defined as constituting the physiological or healthy state. The normal body has great capacity for adapting itself to external conditions; in fact, the manifestations of life consist mainly in responses to external stimuli. This is well seen in the case of individual cells, which in the living state possess a highly selective behaviour toward substances with which they come into contact, e.g. salts or dye-stuffs; many such substances are strictly excluded from entrance into a cell so long as the latter is alive, although after death they quickly diffuse through its substance. But when external agencies are excessive or of particular kinds, they tend to be pathogenic, i.e. to produce disease. Thus mechanical violence (trauma) or excessive heat and cold are pathogenic agencies; more subtle forms of injury result from X-rays and other radiations. Injury of various kinds may be inflicted by chemical agents, e.g. strong acids and alkalies, and alkaloids. Bacteria are an important group of pathogenic agents, and they lead to a great variety of pathological effects. Certain bacteria can enter and flourish in the living tissues; these acts are summed up in the term *infection*. In virtue of being endowed with life and the capacity for multiplication, it follows that the entrance of minute numbers of bacteria may suffice to set up disease. Some organisms, such as the bacilli of diphtheria or tetanus, settle at the point of entry into the body, and produce harmful effects by secreting powerful poisons (toxins), which act on the nervous system; again, others enter the blood-stream and proliferate actively there, causing septicæmia. Very important are the pyogenic bacteria, which cause suppuration and wound-infections. In addition to bacteria, unicellular microscopic animals (protozoa) are the cause of malaria, sleeping sickness, amœbic dysentery, &c. There are a number of important infections in which the causal agent has not yet been identified, e.g. scarlet fever, measles, smallpox; the reason for such failure probably is the minute size of the organisms, which consequently are termed 'invisible viruses'. Higher animal forms, especially species of worms, cause important diseases, e.g. bilharziosis and ankylostomiasis.

Internal causes of Disease.—Certain glands produce internal secretions which are poured into the blood-stream. In the case of the thyroid gland, absence of the secretion causes myxœdema; excessive or perverted secretion causes exophthalmic goitre. In most cases the basis of the disturbed function of such glands is obscure. In old age the tissues commonly show changes which are regarded as pathological if they occur earlier in life; hence it is a debatable point how far old age is a disease. Pathological changes may be classified as degenerative or reactive, according as they exhibit evidence of damage or of reaction to the pathogenic agent. Necrosis or death of tissue, e.g. produced by cutting off the blood-supply, is an example of the former; the latter is illustrated by hypertrophy or increase in the essential tissue of an organ, e.g. of the heart muscle in valvular disease of the heart. In general, the most specialized tissues show least reparative power; when there is loss of substance, as in a wound, repair is mainly effected by the connective tissue, which proliferates to form granulation tissue; the latter finally becomes mature connective tissue. The term *inflammation* is applied to a series of changes, partly degenerative, partly reparative, which occur when an injurious agent, often micro-organisms, damages tissues without immediately killing the part. Reactive processes may lead to recovery; in the case of infections, cure is frequently accompanied by insusceptibility to a second attack, which is called *acquired immunity*. *Tumours* are pathological conditions, which cannot be classed either as degenerative or reparative. They are new growths of tissue which do not serve any purpose of the body in which they arise. Some tumours grow slowly and remain localized (simple tumours). Others (carcinoma, sarcoma) spread through the body owing to their constituent cells being carried by the blood- and lymph-streams to distant organs, where they settle and grow; such malignant tumours destroy the tissues. So far their cause is unknown; but they have been produced experimentally by certain forms of chronic irritation, e.g. in rats round parasitic worms (gonglyonema neoplastica of Fibiger) and on the skin of mice by applications of tar.

Patia'la, Indian native state and town in the Punjab, the largest of the three Sikh Phulkian states, Patiala, Natha, and Jind; area, 5412 sq. miles. Besides the usual agricultural products, the state has slate-, lead-, marble-, and copper-mines. Pop. of the state (1911), 1,407,659. The capital is Patiala, on the Rajpura-Bhatinda branch of the North-Western Railway. It was founded in 1752 by Sardar Ala Singh, and has a pop. of 46,974.

Pat'ina, in the fine arts, the fine green rust with which ancient bronzes and copper coins and medals become covered by lying in particular soils, which, like varnish, is at once preservative and ornamental. An artificial patina is produced by the forgers of antiquities by acting on them with acetic acid, but it is not durable.

Patmore, Coventry Kearsey Deighton, English poet, born in 1823, died in 1896. He published his first volume of poems in 1844, became assistant librarian at the British Museum, and associated himself with the Pre-Raphaelite movement. His reputation as a poet was established by the publication of the four parts of *The Angel in the House* (1854–63), which he revised in successive editions. Besides this he published *The Unknown Eros and other Odes*, a poetical anthology called the *Children's Garland*; and a *Memoir of B. W. Procter* (Barry Cornwall).

Patmos, an island of Asia Minor, in the Grecian Archipelago, about 26 miles s.s.w. of Samos; greatest length, 12 miles; breadth, nearly 6 miles. It has belonged to Greece since 1919. The island is an irregular mass of barren rock, agricultural products are scanty, and the population (mostly Greeks) find their chief occupation in fishing. Near the excellent natural harbour of La Scala is the small town of Patmos, overlooked by the old monastery of St. John, in a grotto of which, it is said, the Apostle John saw his apocalyptic visions. Pop. about 4000.

Patna, a native state of Bihar and Orissa, India, tributary to Orissa, in the basin of the Mahanadi River. The people are Oriyās. Patna was included in the Central Provinces until 1905. Bolangir is the capital. Area, 2400 sq. miles; pop. 420,000.

Patna, a district, division, and city of Bihar and Orissa, India. The district lies south of the Ganges and east of the Son, and is devoted to agriculture. Area, 2000 sq. miles; pop. 1,500,000. The division comprises the districts of Patna, Gaya, and Shahabad. Area, 11,000 sq. miles; pop. 5,500,000. The city of Patna is in Bihar and Orissa, and is second only to Calcutta as the Bengalese metropolis. It lies on the Ganges, and is served by the East Indian Railway from Calcutta. Patna is the ancient *Pataliputra* (q.v.), and as *Palibothra* it was once capital of India. Pop. 150,000.

Paton, Sir Joseph Noel, historical painter, was born at Dunfermline in 1821, died in 1901. He studied for some time at the Royal Academy; attracted attention by his outline etchings illustrative of Shakespeare and Shelley; exhibited his first picture of *Ruth Gleaning* at Edinburgh in 1844; gained one of three premiums at the Westminster competition by his fresco of the *Spirit of Religion*, and a prize of £300 by his paintings *Christ Bearing the Cross* and *The Reconciliation of Oberon and Titania*. During subsequent years he produced many pictures, some well known by engravings, such as *The Pursuit of Pleasure*; *Home*, a soldier's return from the Crimea; *In Memoriam*, a scene from the relief of Lucknow; *Mors Janua Vitæ*; *Faith and Reason*; *Lux in Tenebris*; and *The Man with the Muck-rake*.

Patras (ancient Patræ), a seaport of Greece, in the north-west of the Morea, on the gulf of the same name. It was one of the twelve cities of the Achæan Confederacy of ancient Greece, and is the only survivor. Pop. 37,734.—The Gulf of Patras lies between the north-west part of the Morea and Northern Greece, and communicates on the east with the Gulf of Lepanto.

Patriarchs (from the Gr. *patria*, tribe, *archein*, to rule), heads of families or tribes, and specifically the three Fathers of the Hebrew race, Abraham, Isaac, and Jacob. The term at a later period became the title of the presidents of the Sanhedrin, which exercised a general authority over the Jews of Syria and Persia after the destruction of Jerusalem. From them the title was adopted by the Christians, who applied it, from the beginning of the fifth century, to the Bishops of Rome, Constantinople, Alexandria, Antioch, and Jerusalem. The Patriarch of Rome became the supreme pontiff of the West, the four heads of the Eastern Church preserving the title of patriarch. The Patriarch of Constantinople is the primate of the Greek Church in the Ottoman Empire, and bears the title of *œcumenical*.

Patricians (Lat. *patricius*, from *pater*, father), the name given by the Romans to the members and descendants by blood or adoption of the original *gentes*, houses or clans who, after the plebeians became a distinct order, constituted the aristocracy of the city and territory.

Patrick (Patricius), St., patron saint of Ireland, was born about A.D. 396, probably, as suggested by Rhys, somewhere in the valley of the modern Severn, but claimed by Scots tradition as Old Kilpatrick, near Dumbarton, on the River Clyde. His father, a decurion in the Roman army, retired to a farm on the Solway, whence, at the age of sixteen, Patrick was carried off by a band of marauders and sold as a slave to the Irish of Dalaradia. After six years he made his escape, and, resolving to devote himself to the conversion of Ireland, prepared himself for the priesthood, probably at the monastic institution founded by St. Ninian at Candida Casa (Whithorn), in Galloway. Having been ordained a bishop and received the Papal benediction from Celestine I.

he went over to Ireland about the year 432. Here he is said to have founded over 360 churches, baptized with his own hand more than 12,000 persons, and ordained a great number of priests. The date of his death is probably 469; it took place at a place called Saul, near Downpatrick, and his relics were preserved at Downpatrick till the time of the Reformation. His authentic literary remains consist of his *Confessions* and a letter addressed to Coroticus, a Brythonic king of Strathclyde. Many points connected with the life of St. Patrick are doubtful, and regarding his position in the history of Irish Christianity different views are held. Some authorities identify him with Palladius.—Cf. E. J. Newell, *St. Patrick: his Life and Teaching.*

Patrick, St., Order of, an Irish order of knighthood, instituted in 1783 by George III, originally consisting of the sovereign, the Lord-Lieutenant of Ireland for the time being (who is the Grand Master of the order), and fifteen knights; but by a statute in 1833 the order was enlarged and the number of knights raised to twenty-two. The badge of the order is of gold, oval in shape, with the cross of St. Patrick surmounted by a shamrock in the centre, and round this is a blue enamelled band bearing the motto "Quis separabit". The badge is suspended to a collar of roses and harps by means of an imperial crown and gold harp. The mantle and hood are of sky-blue tabinet, lined with white silk.

Patroc'lus, in Greek story, the friend of Achilles, whom he accompanied to the Trojan War. His success was at first brilliant; but, Apollo having stunned him and rendered him defenceless, he was slain by Euphorbus and Hector.

Pa'tron, in the Roman Republic, a patrician who had plebeians, called *clients*, under his immediate protection, and whose interests he supported by his authority and influence. In later times the term patron was applied to every protector or influential promoter of the interests of others; hence the saints who were believed to watch over the interests of particular persons, places, or trades were called *patron saints.*

Pat'ronage, Ecclesiastical, the right of presenting a fit person to a vacant benefice. In the earlier ages the bishops appointed the holders of all benefices, but subsequently when proprietors of lands began to erect and endow churches they obtained the privilege of nominating the clergyman. For a considerable time not only the nomination but also the investiture of the clergy was in the hands of laymen; but the hierarchy began to consider this an infringement of its prerogatives, and several successive Popes and Councils declared that the investiture was not valid unless it had also received the sanction of the ecclesiastical authority. Ecclesiastical patronage thus came to reside mainly in the Pope, and the principal benefices in Europe were filled by Italian ecclesiastics, who were often ignorant of the language of their flocks. In England this led to the Statutes of Provisors (1350–1415), by which persons who should attempt to enforce such appointments were subjected to severe penalties. In England the sovereign is the patron paramount of all benefices which do not belong to other patrons; but a vast number of livings are in the gift of private persons, who possess the *advowson* as attached to their property. In Scotland the statute which abolished Popery and recognized the reformed religion reserved the right of presentation to lay patrons (1567), and a subsequent statute (1592) asserted the rights of the Crown and lay patrons in still stronger terms. On the establishment of Episcopacy the same principle was adopted in the Act of 1612, by which presentations were appointed to be directed to the bishop. After the re-establishment of presbytery patronage was abolished (1649). It was again restored, however; again abolished; and again restored, in the last instance by the Act 10 Anne, cap. xii; and this rule remained with slight modification till 1874, when an Act was passed by which the right of choosing their own minister devolved upon the congregation, the former patron to receive as compensation a sum equal to one year's stipend.

Patti, Adelina Maria Clorinda, famous operatic singer, born at Madrid in 1843, died 27th Sept., 1919. She received her musical training from her brother-in-law, Maurice Strakosch; made her début in New York in 1859 as Lucia; and in 1861 appeared at Covent Garden, London, in the parts of Amina, Violetta, Zerlina, and Martha. In 1868 she married the Marquis de Caux, but got a divorce in 1883. In 1886 she married Signor Nicolini, and in 1899 Baron Cederström. Her remains were interred in Père Lachaise, Paris.

Pattison, Mark, English writer, born in 1813, died in 1884. Educated at Oriel College, Oxford, he became a Fellow of Lincoln College in 1839; studied theology, was ordained, and won the Denyer theological prize. In 1853 he was appointed tutor of his college, and in 1861 became rector (or head) of Lincoln College. He devoted himself to university reform, for this purpose made many journeys to Germany, and was assistant-commissioner on the Educational Commission of the Duke of Newcastle. He was a contributor to the famous *Essays and Reviews*, and published an edition of Pope's *Epistles and Satires* (1869), a work on *Isaac Casaubon* (1875), a memoir of *Milton* in the English Men of Letters Series (1879), the *Sonnets of Milton* (1883), and numerous articles in reviews.

Pau (pō), a town of France, capital of the department of Basses-Pyrénées (formerly of Béarn), on a height above the Gave-du-Pau, and on the southern railway to Toulouse. Among its chief buildings are two Gothic churches, a palace of justice, and a winter palace built in 1896. The town is dominated by the castle in which Henry IV was born. The oldest part is supposed to date from 1363, and the whole is well preserved. Pau is a favourite winter-resort, enjoying a mild dry climate, with no sudden variations of temperature. Pop. (1911), 37,150.

Paul, the name of five Popes. **Paul I**, Pope from 757–767, brother of Stephen II, stood on good terms with Pepin and Charlemagne.—**Paul II**, Pope from 1464–71, a native of Venice, originally called Pietro Barbo, caused a crusade to be preached against the Hussites.—**Paul III**, Pope from 1534–49, formerly Alessandro Farnese, excommunicated Henry VIII (1535), concurred in the foundation of the Order of Jesuits, opened the Council of Trent, defended himself by his legates in the conferences between Catholics and Protestants at the Diets of Worms and Ratisbon, and established a general Inquisition for the suppression of Protestantism.—**Paul IV**, Pope from 1555–9, formerly John Peter Caraffa, energetically directed the power of the Inquisition against everything tending to favour Protestantism, and established an *Index Librorum Prohibitorum*.—**Paul V**, Pope from 1605–21, formerly Camillo Borghese, succeeded Leo XI.

Paul I, Tsar of Russia, son of Peter III and Catherine II, born in 1754, died 24th March, 1801. On the death of Catherine in 1796 he succeeded to the throne, and began his reign with acts of generosity. He put an end to the war with Persia, and liberated the Poles who were in confinement in Russia. He joined the coalition against France, and sent 100,000 men, under Suwarov and Korsakov, to Italy and Switzerland, and some to Holland, but he afterwards favoured the cause of Napoleon. Paul caused himself to be declared Grand Master of the Knights of Malta (1798), but Britain, having conquered the island in 1800, refused to surrender it to the Russian emperor. He therefore laid an embargo on all British ships in the Russian ports, and prevailed upon the Swedish, Danish, and Prussian courts to enter into a convention against Great Britain. At length (1801) the internal administration and his increasing acts of tyranny gave rise to a strong popular discontent, and he was assassinated in his bed.

Paul, St. A few years after the birth of Jesus, another Jewish child was born who was to play a part in the interpretation and extension of the religion of Jesus, second to none but the founder. This Jew was born not in Palestine but in Tarsus, the famous capital of the Roman province of Cilicia, in Asia Minor. His parents were both Jews, and from his father the lad inherited the coveted privilege of being a Roman citizen. Tarsus was a well-known centre of education and culture. But this young Jew was sent by his parents to be trained, at any rate after his childhood, in the rabbinic school at Jerusalem, where he had the good fortune to be a pupil of Gamaliel I. He may have been studying there when Jesus was arrested and executed at Jerusalem, but he was not an adherent of the Galilean prophet. During this early period of his life he was an ardent Jew, passionately keen upon the faith of his race, a member of the Pharisaic party which represented the zeal and orthodoxy of Judaism.

This youth was called Saul, after the first King of Israel, to whose clan of Benjamin he belonged. He had a second name, Paul or Paulus, like many Jews who were in touch with the outside world, where a double name was normal. Whether 'Paul' was the name given to him at birth by his parents, or whether he assumed it afterwards, is indeed a disputed point.

His first relations with Christianity were hostile. The synagogue of the Cilicians, to which he would naturally be attached in Jerusalem, was involved in the bitter controversy over Stephen, who relentlessly expounded the issue between Judaism and Christianity. This was shortly after the crucifixion. Paul assisted those who murdered Stephen, although his assistance was passive. But his energy soon carried him into active measures against what he regarded as a pestilent heresy; he was commissioned by the authorities at Jerusalem to travel north to Damascus and stamp out a local growth of Christianity which had appeared in the ghetto. Evidently Paul was regarded as one of the most promising young leaders of Judaism in its militant Pharisaic form. It was on this tour that he suddenly became a Christian. As he reached Damascus he had a vision of Jesus, accompanied by some physical crisis. The next news that reached the capital was that Paul had gone over to the new faith. The Christians were as astounded as the Jews; they heard that "he who persecuted us in times past now preacheth the faith which once he destroyed".

The inwardness of Paul's conversion may be made out in part from autobiographical hints in his later letters. Evidently he had been secretly dissatisfied with Judaism, and his very effect to suppress Christianity may have been whetted by a desire to stifle his doubts by means of action. In any case, he proved a redoubtable accession to the Christian religion. His powers of thought and organization were now flung into the task of consolidating and expanding Christianity with the same zeal with which he had once attacked it. His restatement of Christianity involved a severe criticism of the Pharisaic Judaism from which he had broken away. This is sometimes viewed as unfair. But Paul estimated Judaism as Luther estimated mediæval Romanism, not as a cold historical critic, but as one who had suffered from its religious aberrations. He realized, more thoroughly than even Stephen had, the freedom from the law which was involved in the principles of Jesus. Wellhausen is right in declaring that " Paul was really the man who best understood the Master and carried on His work ", for, although his methods of argument are often tinged with rabbinic dialectic, and although his theological speculations are fresh, his redemptive interpretation of Christianity is essentially true to the implication of the original faith. He was not the first to preach the freedom of the Gospel for people of non-Jewish birth. But he was the first to carry out this tenet logically, in thought and practice.

All this, however, was in the future. For a time Paul was left in obscurity. After his conversion, followed by a brief period of retirement, he did some effective preaching at Damascus and at Jerusalem, but his life was in danger from the irate Jews. He then retired to his own country. In Cilicia and Syria he spent from ten to fourteen years, evangelizing, no doubt, but apparently ignored by the main body of the Church in Palestine. During this period his mind improved. But one result of the long interval is that Paul, like Knox, was a middle-aged man before he was summoned to his life-work.

The first Christian who recollected him was Barnabas. The growth of the Christian mission at Antioch necessitated help from the outside; Barnabas bethought him of Paul, who was summoned from Cilicia and associated for a whole year with him at Antioch. From this time forward he is in the main current of Christianity. Even before the Council at Jerusalem, which permitted the mission to non-Jews, Paul was dispatched along with Barnabas by the Church of Antioch as the first foreign mission. This occupied them for not less than three years. It embraced Cyprus and some districts in Pisidia and Pamphylia on the mainland, to the south of Asia Minor. The success of this mission startled the conservative Jewish Christians at Jerusalem, who were opposed to anyone entering the Christian Church except by accepting the Jewish law. The controversy was decided in favour of Paul and his party, thanks largely to the good sense of Peter. Whereupon Paul set out on a fresh tour, first in Asia Minor, and then in Europe, which he reached by sailing across the Ægean from Tarsus. He and his colleagues founded a line of Churches from Macedonia right down to Corinth, the one city in which little success was won being Athens. This fruitful and difficult mission must have occupied nearly three years. Paul then made Ephesus his head-quarters, from which he could keep in touch with the European Churches and also organize a Christian propaganda in Asia itself. This mission lasted for two years, at the end of which a local riot obliged him to withdraw. He then left for Jerusalem, never to return. In the capital he was arrested at the instigation of some Asiatic Jews, and spent the rest of his life as a prisoner, first in Jerusalem, then at Cæsarea, and finally in Rome. He must have spent from six to ten years in captivity; the chronological data are uncertain, however, and the one point which emerges with undisputed clearness is that he shifted the venue of his trial from Palestine to Rome by appealing to the emperor. This was because he exercised one of the rights which he enjoyed as a Roman citizen. What happened to him in the end we do not know. That he was put to death is certain. But why and when we cannot tell. Later traditions fix his martyrdom in the latter years of Nero's reign, and it must have occurred before the burning of Rome in A.D. 67. When he died he would be about or slightly over sixty years of age. His main work for Christianity had been done since he was forty.

How important that work was, history can now appreciate. In his day Paul was thwarted and suspected by many men within the Church. He was followed by conservative Jewish Christians, who maligned his character and unsettled his Churches. He was also in repeated danger, owing to the deadly hatred of the Jews, who realized his worth perhaps more keenly than most of his fellow-Christians did. When he died it seemed as if his work was threatened with an eclipse, and his particular theology was soon misunderstood or ignored by the Church. Other influences came to the front. But Paul had finally won the battle of Christianity against Jewish conservatism within as well as without the Church. After him, the law no longer oppressed converts from paganism. He had also given an impetus to the interpretation of Christianity which was of vital importance; he had drawn probably upon contemporary speculations in hellenistic religion, and his views of Christianity may have been indebted here and there to the mystery-religions, but his theology was his own, and it was dominated by a sense of the supreme position of Jesus as Lord. Furthermore, as an organizer and a propagandist—for Paul was both, in addition to being a thinker—he had broken new territory for the faith. He had not only shown how Christianity could not remain a plant in Jewish soil if it was to survive and thrive, but had proved that it could be transplanted to the outside provinces of the empire. "The future history of Europe and America for two thousand years," as Dean Inge observes, "perhaps for all time, was determined by his missionary journeys and hurried writings. It is impossible to guess what would have become of Christianity if he had never lived; we cannot even be sure that the name of Jesus would still be honoured amongst men."

These 'hurried writings' are his letters, composed during the afternoon of his life, to meet exigences of his mission. They are all written to Churches which he had founded, with the exception of two, viz. *Romans* and *Colossians.* One is a semi-private note (*Philemon*). Another, the so-called epistle to *The Ephesians,* was addressed to a wider circle of Churches, and may have been written by one of his disciples. These epistles, two to Timothy and one to Titus, may contain fragments from his pen, but in their present form are the work of a later writer belonging to his school. It is from these letters, and from the story in the book of *Acts,* written by his medical friend Luke, that the biographical outline of Paul's life can be recovered.—BIBLIOGRAPHY: From the vast bibliography, these items may be selected. (*a*) Biographical sketches by Conybeare and Howson, *Life and Epistles of St. Paul* (1877); W. M. Ramsay, *St. Paul the Traveller and the Roman Citizen* (1895); A. Sabatier, *The Apostle Paul* (1906); and G. A. Deissmann, *St. Paul* (1912). (*b*) Studies of his letters and theology by B. Jowett, *Epistles of St. Paul* (3rd edition, 1894); A. B. Bruce, *St. Paul's Conception of Christianity* (1894); Kirsopp Lake, *The Earlier Epistles of St. Paul* (1911); P. Gardner, *The Religious Experience of St. Paul* (1911); H. A. A. Kennedy, *St. Paul and the Mystery-Religions* (1913); W. Morgan, *The Religion and Theology of Paul* (1917); B. W. Bacon, *Jesus and Paul* (1921); and J. G. Machen, *The Origin of Paul's Religion* (1921). (*c*) General estimates by E. Renan, *Saint Paul* (1869); C. G. Montefiore, *Judaism and St. Paul* (1914); and Dean Inge in *Outspoken Essays.*

Paul, St. Vincent de, Roman Catholic philanthropist, born of poor parents in Southern France in 1576, died in 1660. Educated at Dax and Toulouse, he was ordained a priest in 1600; in 1605 he was captured by pirates; remained in slavery in Tunis for two years, and finally escaped to France. He afterwards visited Rome, from whence he was sent on a mission to Paris, where he became almoner to Queen Margaret of Valois. In 1616 he began the labours which occupied so large a portion of his life, and which included the foundation of the institution called the Priests of the Mission or Lazarists, the reformation of the hospitals, the institution of the Sisterhood of Charity, and the instruction of idiots at his priory of St. Lazare. Among the last acts of his life was the foundation of an asylum for aged working-people of both sexes, and a hospital for all the poor of Paris, which was opened in 1657. He was canonized in 1737.

Paulicians, an Oriental anti-Catholic sect founded in the seventh century (possibly earlier) in Armenia. Gibbon (*Decline and Fall of the Roman Empire,* chap. liv) says of the Paulicians that "they gloried in their affinity to the Apostle of the Gentiles". The invincible spirit which they had kindled continued to live and breathe in the Western World, and they may be considered as the precursors of Protestantism. They rejected the adoration of the Virgin and the saints; refused homage to the cross; denied the validity of the sacraments; interpreted spiritually baptism and the Lord's Supper; would not recognize any priestly dignity; and their public worship was altogether free from ritual. They suffered severe persecution at the hands of the Byzantine emperors, but as late as the sixteenth century remnants of the sect were found in Bulgaria.

Paulsen, Friedrich, German philosopher of the Neo-Kantian school, born 16th July, 1846, died 14th Aug., 1908. He studied at Erlangen and Berlin, where he became professor of philosophy in 1878. A disciple of Fechner, he adopted the latter's theory of the parallelism of the mental and the physical. His works include: *Kant, der Philosoph des Protestantismus*; *Schopenhauer, Hamlet und Mephistopheles*; *Ethik*; and *Einleitung in die Philosophie.*

Paulus Ægine'ta, Greek physician, born, it is supposed, in the seventh century in the Island of Ægina, and connected with the medical school at Alexandria. He abridged the works of Galen, and was deeply read in those of Hippocrates and others. His *Synopsis of the Medical Art* has been translated into English.

Paulus Diac'onus, Italian ecclesiastic and mediæval historian, born about A.D. 730, died about 800. He was educated in the court of the Lombard kings at Pavia. In 781 he was called to the court of Charlemagne, and was one of the principal instruments of the intellectual reforms effected by the emperor in the countries of Western Europe. Paulus drew up a book of homilies from the Fathers, wrote a history of the Bishops of Metz, and a history of the Lombards.

Pausa'nias, a Spartan general, nephew of Leonidas. He commanded the allied Greeks against the Persians at the battle of Platæa in 479 B.C. To himself alone he ascribed the victory, and his pretensions became insupportable when he afterwards, with a combined Greek fleet, delivered Greece, Cyprus, and finally Byzantium from the Persian rule. At length he entered into secret negotiations with Xerxes, and conceived the design of making himself master of Greece. To escape arrest he sought shelter in the temple of Athene at Sparta, where he was shut in by the enraged people and starved to death (467 B.C.).

Pausanias, a Greek traveller and geographer who lived in the second century after Christ, and of whose personal history nothing is known. His *Hellados Periēgēsis* (Peregrination of Hellas) is an itinerary in ten books of his travels, which were extensive. He appears to have visited the whole of the Peloponnesus, Rome, Syria, and Palestine. He describes temples, theatres, tombs, statues, pictures, and monuments of every sort. He also mentions mountains, rivers, and fountains, and the mythological stories connected with them. His observation is accurate, and his descriptions simple and reliable. His work also contains a great deal of matter relating to history, mythology, and art. The principal English edition is that by Sir J. G. Frazer, with translation and commentary.

Pa′via, a province of Lombardy, North Italy, extending between the Ligurian Appenines and the valley of the Po. Area, 1287 sq. miles; pop. (1915), 514,506.

Pavia (ancient **Ticinum**), a city of Lombardy, Italy, the capital of the province of Pavia, on the Ticino, near its junction with the Po. The city is still partly surrounded by old walls and fortifications, and is connected with the Adriatic by the Po and Ticino, and with Milan by a canal. The principal buildings are the cathedral (founded 1487), containing the tomb of St. Augustine; the church of San Michele, dating from the eleventh century; and the university, founded in 1361 by Galeazzo II on the site of an establishment founded by Lanfranc (died 1088). The manufactures are unimportant, and the trade almost entirely local. About 4 miles to the north is the Certosa di Pavia, an old Carthusian monastery.

Pavia was a place of importance in the time of Augustus. It was afterwards the capital of the Lombard kings. Near it in 1525 the Imperialists defeated the French and took prisoner their king, Francis I. Pop. (1915), 40,729.

Pavlograd, a town of Southern Russia, on the Voltcha, and in the government of Ekaterinoslav; served by the Sevastopol-Kursk Railway. Pop. 41,160.

Pawl. See *Ratchet.*

Pawnbrokers, persons who lend money on goods *pledged* or deposited with them at a legally fixed rate of interest, and under the restriction of a Government licence. Although this mode of borrowing is occasionally taken advantage of by all classes, and bankers, when they accept security for their advances, act on the same principle as the pawnbroker, the business, as a special one, originates chiefly in the necessities of the poor. In the Middle Ages lending upon pledges was a trade almost exclusively pursued by Jews and Lombards. On the European continent this form of borrowing is partly conducted by charitable institutions called Monts de Piété. In England pawnbrokers were recognized by statute in the reign of James I, and in 1872 an Act was passed to consolidate all the Acts relating to pawnbrokers in Great Britain; but it does not extend to Ireland. Every person who keeps a shop for the sale of goods, and pays or advances any sum of money upon such goods not exceeding £10, on an agreement, express or implied, that these goods or chattels may afterwards be repurchased or redeemed, shall be deemed a pawnbroker. They are required to take out a licence (£7, 10*s.* per annum). Pawn-tickets are given for goods taken in pledge, and the interest charged is fixed by law. By the Act of 1872, on a loan under 40*s.*, ½*d.* may be charged on every 2*s.* for a period not exceeding one month, and so on at the same rate per calendar month; and when the sum is above 40*s.*, ½*d.* may similarly be charged on every 2*s.* 6*d.* An Act of 1922 authorizes an additional charge of ½*d.* on each 5*s.* advanced in the case of loans not exceeding 40*s.* When the pawn-ticket has been lost, a printed form of declaration may be got and filled up in place of it. Goods pledged and not redeemed may be sold after twelve months and seven days from the date of pledge. At the end of that time pledges pawned for 10*s.* or under become the property of the pawnbroker. Pledges for more than 10*s.* must be disposed of by public auction, subject to certain regulations, and they continue redeemable until so disposed of. The entry of sale may be inspected within three years by the pledger in the broker's books, and in the catalogue of sale certified by the auctioneer, and he may claim any surplus above loan and profit with the necessary charges. When the loan exceeds 40*s.*, the pawnbroker is at liberty to make a special contract with the pawner.

Pawtuck′et, a city of Rhode Island, United States, in Providence county, on the Blackstone River; served by the New York, New Haven, & Hartford Railroad, and by the river, which is navigable below the falls. The Pawtucket Falls have a perpendicular drop of 50 feet, and are tapped for hydro-electric power. Samuel Slater established at Pawtucket the first of the United States cotton-mills (1790), and the city is now a great manufacturing centre. It was founded about 1670, and became a city in 1885 after the absorption of townships on both sides of the river. Pop. (1920), 64,248.

Pax, an ecclesiastical utensil in the Roman Catholic Church, formed usually of a plate of metal, chased, engraved, or inlaid with figures representing the Virgin and Child, the crucifixion, &c., which, having been kissed by the priest during the *Agnus Dei* of the High Mass, is handed to the acolyte, who presents it to be kissed by each of the ecclesiastics officiating, saying to them *Pax tecum* (peace to thee). The decorations of the pax are frequently very rich.

Paxos, or Paxo, one of the Ionian Islands, belonging to Greece, 9 miles south of Corfu. It is nearly 5 miles long and 2 miles broad, and consists of a mass of limestone rock. Principal product, olive-oil of the finest quality. Pop. 4000.

Paxton, Sir Joseph, British gardener and architect, born in Bedfordshire 1801, died 1865. He was educated at the free school of Woburn; became gardener, and in 1826 estate manager to the Duke of Devonshire at Chatsworth, in Derbyshire. In 1851 he designed the Crystal Palace for the great International Exhibition (London), and soon after was knighted. He edited *The Horticultural Register*, *The Magazine of Botany*, *The Cottage Calendar*; and was the author (with Lindley) of a *Botanical Dictionary* and of *Paxton's Flower Garden*. From 1854 until his death he was member of Parliament for Coventry.

Paymaster, an officer in the British army and navy, through whom the officers and men receive their pay. The Army Pay Department comprises chief-paymasters, staff-paymasters, and paymasters, all with the rank of officers, while there is a corps of clerks, and a corps of accountants for costing purposes. Naval paymasters are administrative officers with a multiplicity of duties. They are responsible chiefly for pay and messing, but also deal with matters such as clothing and the victualling and fitting out of ships. In battle paymasters and their staffs are attached to the surgeons, and act as stretcher-bearers, &c. See under *Officers*.

Paymaster-General, a British Government officer whose duties were formerly limited to the army, but who now acts as paymaster-general of all the services. Formerly it was a lucrative, but is now an unpaid office. The assistant paymaster-general, however, is a paid official, with a staff under him.

Payn, James, British novelist, born at Cheltenham in 1830, died in 1898. Educated at Eton, Woolwich Academy, and Trinity College, Cambridge, he published poems and contributed to periodicals. He became editor of *Chambers's Journal* in 1858, and of the *Cornhill Magazine* in 1883; wrote many novels, including *Lost Sir Massingberd*, *Found Dead*, *By Proxy*, *The Talk of the Town*, *The Luck of the Darrels*, *The Heir of the Ages*; besides *Literary Recollections* and *Gleams of Memory*.

Paysandú, a department of Western Uruguay, South America, on the Rio Uruguay, which separates it from the Entre Rios province of Argentina. It is entirely devoted to stock-raising, and is of great importance as a beef-producer. Capital, Paysandú. Area, 5115 sq. miles; pop. (1919), 73,511.

Paysandú, a city of Uruguay, South America, capital of the department of Paysandú, on the Rio Uruguay, and one of the principal seaports of the Uruguayan Republic. It is served by railway to Montevideo and Buenos Aires in the south, and to the Brazilian frontier in the north. There are extensive abattoirs, and a large trade in live-stock is carried on through the port, which is at the head of low-water navigation on the river. Paysandú was founded in 1772, and is named in honour of Father (Pai) Sandú, who settled there in that year. Pop. (1920), 26,000.

Payta, a seaport of Northern Peru, in the department of Piura, and connected by railway with Piura, the capital of the department. Cotton is exported. The port is equipped for oil traffic. Pop. 5000.

Pea, a well-known leguminous plant of the genus Pisum, the *P. sativum*, of many varieties. It is a climbing annual plant, a native of the south of Europe, and has been cultivated from remote antiquity. It forms one of the most valuable of culinary vegetables; contains much farinaceous and saccharine matter, and is therefore highly nutritious. It is cultivated in the garden and in the field. Its seed-vessel is a pod containing one row of round seeds, which are at first soft and juicy, in which state they are used for the table under the name of *green peas*. They afterwards harden and become farinaceous. A whitish sort, which readily splits when subjected to the action of millstones, is used in considerable quantities for soups, and especially for sea-stores. There is a blue sort which answers the same purpose.

Pea-beetle, a coleopterous insect (*Bruchus pisi*) about ¼ inch long, black, with white spots and dots on the wing-cases, very destructive to crops of pease in the south of Europe and in North America. Called also *Pea-bug*, *Pea-chafer*, and *Pea-weevil*.

Peabody, George, American philanthropist, born at Danvers, Massachusetts, 1795, died 1869. In 1843 he came to London and established the firm of George Peabody & Co., exchange brokers and money-lenders. Having acquired a large fortune, he gave £100,000 to establish a free library in his native town; presented £200,000 to found a free library and institute of art and science at Baltimore; and in 1862 placed £150,000 in the hands of trustees for the benefit of the poor of London, to be employed in building model dwelling-houses. He afterwards added £350,000 to this benefaction.

Peace Conference, a term applied to a meeting of representatives of different nations to settle important questions, territorial and otherwise. A peace conference usually takes place after hostilities, as the peace conference of the Allies in 1919 after the European War. The term is, however, also applied to the international conferences held at The Hague in 1899 and 1907. (See *Peace Movement.*) Several other peace conferences have been convened since 1919, at Cannes, Hythe, Boulogne, Spa, Genoa, and The Hague.

Peace Movement. The modern peace movement may be said to have originated in 1462, when Georg Podiebrad, King of Bohemia (1420–71), proposed a plan for a federation of Christian nations. Towards the end of the sixteenth century Henri IV of France advanced a similar plan. Numerous schemes for the purpose of assuring a permanent world peace followed during the seventeenth and eighteenth centuries, such as those of Emeric Cruce (1590–1648), the Abbé St. Pierre (1658–1743), and others. Grotius wrote his famous work *De jure belli et pacis* (1625). Leibnitz and the Encyclopædists, and Joseph Priestley, in England, were in favour of peace, whilst Jeremy Bentham (1748–1832) elaborated a plan for a universal and permanent peace. In Germany, too, Lessing and Herder raised their voices in favour of peace, and in 1793 Kant wrote a plea for eternal peace. After the Napoleonic wars pacifism gained ground and peace organizations were founded. The first peace society was organized in London in 1816, and another was founded at Geneva in 1830. In 1889 the first World's Peace Congress was held in Paris, and in 1898 Ivan de Block published his monumental work on war, a work which is said to have suggested to Nicholas II, Tsar of Russia, the idea of inviting the Powers to meet in conference at The Hague. Peace organizations have since multiplied, and Nobel peace prizes have been distributed, but no peace propaganda could prevent the European War. See *League of Nations.*—BIBLIOGRAPHY: Norman Angell (R. N. A. Lane), *The Great Illusion*; E. B. Krehbiel, *Nationalism, War, and Peace.*

Peace River, a river of Canada, which rises in the Rockies of British Columbia, flows north-eastwards, receives the drainage of Lake Athabasca, and finally enters the Great Slave Lake under the name of the Slave River. It is 1000 miles in length, and is navigable for a large part of its course.

Peach, a tree and its fruit, of the almond genus (ord. Rosaceæ), the *Prunus persica*, of many varieties. This is a delicious fruit, the produce of warm or temperate climates. The tree is of moderate stature, but varies in this respect according to soil and climate. The varieties of the fruit, which is a large downy drupe containing a stone, are very numerous, differing in size, flavour, and time of ripening, but they are principally of two sorts, the *free-stones* and the *cling-stones*, so called according as the stone separates readily or adheres to the flesh. The peach tree is supposed to have been introduced into Europe from Persia. In the southern parts of England it is grown out of doors, and in the United States it is extensively cultivated, great quantities being canned for export. The ripe fruit is distilled and made into peach brandy. The nectarine is a smooth variety of the peach.

Peacock, Thomas Love, English novelist and poet, was born in 1785, and died in 1866. His father, a wealthy glass-merchant, died when Peacock was three. He was educated at a private school at Englefield Green, but was mainly a self-taught scholar, acquiring a wide knowledge of classical literature, especially Greek poetry. He became an intimate friend of Shelley, whom he met in 1812. His enthusiasm for Greek literature was infectious, and immensely beneficial to the work of Shelley. Peacock, after a more or less desultory career, entered the employment of the East India Company in 1819, and served it faithfully until 1856. He played an important part in promoting the construction of iron steamships for Eastern waters.

Peacock's poems, with the exception of *Rhododaphne* and the lyrics embedded in the novels, are not of much account. His reputation rests upon his seven novels, which are *Headlong Hall* (1816), *Melincourt* (1817), *Nightmare Abbey* (1818), *Maid Marian* (1822), *The Misfortunes of Elphin* (1829), *Crotchet Castle* (1831), and, after a long silence, *Gryll Grange* (1860). Of these *Nightmare Abbey* and *Crotchet Castle* are perhaps the most brilliant. *Maid Marian* and *The Misfortunes of Elphin* are somewhat different from the others, as they use the form of a romantic tale as a stalking-horse, from behind which they shoot at contemporary follies. *Melincourt*, which has for its hero an almost human orang-utan, is the only failure of the series. *Gryll Grange* is almost as fresh and humorous as the earlier novels, and is a wonderful piece of work for a man of seventy-five. Peacock's novels have a charm and fascination that is all their own. They appeal to the head rather than to the heart, but have always found 'fit audience though few'. They are practically without plot, and their characters are not men, but personified 'humours' like those of Ben Jonson. Their virtue lies in their grace of style, accuracy of natural description, and sound common sense, and also depends not a little upon the charming lyrics they contain. In this last respect they resemble the ancient Menippean satire, and the *Satiricon* of Petronius (q.v.). They have already outlived, and will doubtless continue to outlive, many novels that were not 'caviare to the general'.—Cf. A. M. Freeman, *Thomas Love Peacock.*

Peacock, called also **Peafowl**, a large and beautiful bird of the pheasant family (Phasianidæ), genus Pavo. The common peacock, *P. cristātus*, is a native of India and South-Eastern Asia. This bird is characterized by a crest of peculiar form, and by the tail-coverts of the male extending far beyond the quills, and being capable of erection into a broad and gorgeous disc. The shining, lax, and silky barbs of these feathers, and the eye-like spots which decorate their extremities, are known to every one. The colours and plumage are said to be more brilliant in the wild than in the domesticated state. The wild peahen lays from twenty-five to thirty eggs, and produces only a single brood in each year. The young birds of both sexes are feathered alike for the first two years; and in the third year the tail-coverts of the male begin to be developed and to assume their lustrous appearance. The black-shouldered or Japan peacock (*P. nigripennis*) is regarded as a variety of the common species; the Javan peacock (*P. muticus*) is a distinct form.

Peacock-butterfly, a name given by collectors of insects to butterflies of the species *Vanessa io*, from the eyes on their wings resembling the eyes on peacocks' feathers.

Peacock-fish, a fish of the Mediterranean and Indian Seas (*Crenilabrus pavo*), characterized by the brilliancy of its hues—green, yellow, and red.

Pea-crab, a small brachyurous crustacean of the genus Pinnothēres, which lives in the shells of oysters, mussels, and other bivalves. Two or three species are met with in Britain.

Peak, or **High Peak**, a district of England, forming the north-west angle of Derbyshire and the southern end of the Pennine Chain, and consisting of a wild and romantic tract, full of hills, valleys, and moors, and celebrated for its limestone caverns and grottoes. The famous Peak Cavern at Castleton, the capital of the Peak District, is a spacious limestone cavern, entered by a natural arch 40 feet high and more than 100 feet wide. Near Castleton is Peveril Castle, which figures in Scott's *Peveril of the Peak.*

Pea-maggot, the caterpillar of the pea-moth (*Grapholitha pisana*), which lays its eggs in peas, to which the larva is very destructive. It is common in Britain, and especially mischievous in wet seasons.

Pea-ore, the name given to granular argillaceous oxide of iron, from its occurring in small masses or grains, nearly or quite spherical, and of the size of a pea.

Pear, a tree of the genus Pyrus, ord. Rosaceæ, *P. commūnis*, which grows wild in many parts of Europe and Asia, and from which the numerous cultivated varieties have originated. The fruit is characterized by a saccharine aromatic juice, a soft and pearly liquid pulp, melting in the mouth, as in the butter-pear; or by a firm and crisp consistence, as in the winter bergamots. The pear is chiefly propagated by grafting or budding on the wild pear stock, or on stocks raised from the seeds of cultivated pears, called free stocks. It is also grafted on the quince, the medlar, and the white thorn. At the present day more than 200 varieties are enumerated, and constant accessions are made every year. France and the north of Italy are celebrated for the perfection to which they have carried the culture of this fruit. Numerous varieties are cultivated solely for the purpose of making perry, a liquor analogous to cider, and prepared nearly in the same manner. The wood is fine-grained, of a yellowish colour, and susceptible of a brilliant polish. In the early ages of Greece it was employed in statuary; now it is used for musical instruments, the handles of carpenters' tools, in wood-engraving, &c.

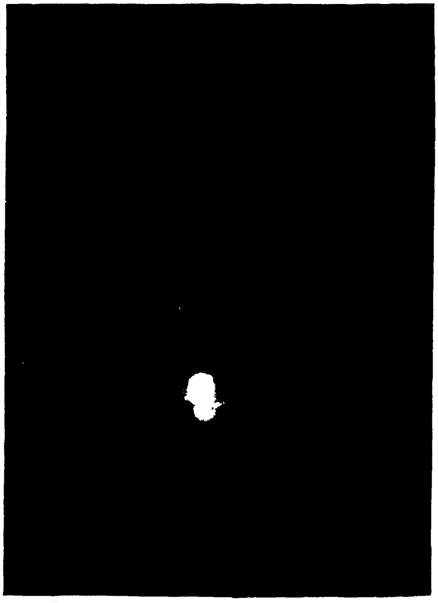
Pearl, the name applied to a concretion produced within the shells of certain species of molluscs, mostly bivalves, as the result of some abnormal secretory process. These concretions are highly valued, and are classed among the gems. The production of a pearl is generally begun by the introduction of some foreign body, such as a grain of sand or a parasite, within the mantle-lobes. The presence of this body has the effect of setting up an irritant action, resulting in the deposition by the mantle of a quantity of nacreous material over the offending particle. This material, in certain species of molluscs, is of such a texture and character, and is so deposited in regular laminæ or layers, that in due time the structure known as a 'pearl', varying in worth and brilliancy, is formed. It has been demonstrated in the case of the 'orient' pearls from the Gulf of Manaar that their formation is caused by the dead embryos of a kind of tapeworm, which passes through the other stages of its existence in the file-fish and a kind of ray. Chief amongst pearl-forming molluscs are the pearl-oyster (*Meleagrīna margaritifĕra*), the pearl-mussel (*Avicŭla margaritifĕra*), and the fresh-water mussels (genus Unio) of British rivers. Pink pearls are chiefly obtained from the giant conch shell (*Strombus gigas*) of the West Indies.

The chief pearl-oyster fisheries are those of Ceylon, which, together with the fisheries in the Persian Gulf, were known to the ancients. The chief seat of the Ceylon fishery is in the Gulf of Manaar, on the north-east of the island. It begins in February or March, and extends over a period of about a month, a large fleet of boats being usually engaged in it. The average depth at

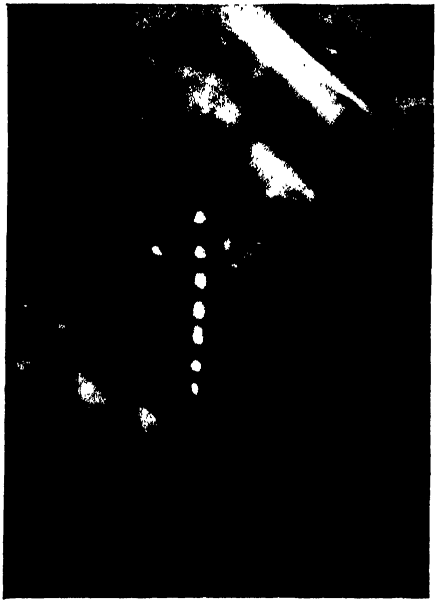
PEARLS

Pearl-shell with group of Golden Pearls

Queensland Pearls on black-lipped Pearl-shell



Pearl produced by operation on the Animal



Southern Cross Pearl

which the oysters are found varies from 60 to 70 feet, and the divers are let down by a stout rope weighted by a heavy stone. Having gathered a number of the oysters into a net, at the end of half a minute or so the diver is pulled up. The oysters being carried to shore, and laid in piles, in about ten days become thoroughly decomposed. They are then thrown into sea-water, and carefully examined for pearls; whilst the shells, after being cleaned, are split into layers for the sake of the mother-of-pearl. The pearl-fisheries of Ceylon are a Government monopoly, but the revenue derived from them is not a regular one, the fishery sometimes failing for years in succession. There was no fishery, for example, between 1837 and 1854, or between 1891 and 1902. The best pearls are found about Ceylon, Persia, and other Eastern coasts, and inferior ones on the tropical coasts of America. The pearl-oyster occurs throughout the Pacific. Very fine pearls are obtained from the Sulu Archipelago on the north-east of Borneo. For some time pearl-fishing has been practised with success in Australian seas, the diving-dress being used. It is carried on also in the Gulf of Mexico, upon the coast of California, and in the vicinity of Panamá.

Pearls have also been obtained from the freshwater mussels of British streams, and Scottish pearls were famed even in the Middle Ages. The Scottish pearl-fishery, after being abandoned for years, was revived in 1860, and in 1865 the produce of the season's fishing in the Scottish rivers was worth at least £12,000. The yield, however, has not been maintained. Many rivers of Ireland and Wales furnish pearls. The pearl-fisheries of Britain are now, however, practically neglected, but river-pearls are systematically sought for in Germany, in the United States, and especially in China.

Pearls have formed valued articles of decoration and ornament from the earliest times. They were first sought for superstitious reasons, in the belief that they averted misfortune and brought luck. Julius Cæsar presented Servilia, the mother of Marcus Brutus, with a pearl valued in modern computation at £48,000; while Cleopatra was said to have swallowed one gem valued at £60,000 or £80,000. A pearl purchased by the traveller Tavernier is alleged to have been sold by him to the Shah of Persia for £180,000. The ' Pilgrim ' pearl of Moscow is diaphanous in character, and weighs 24 carats.

Artificial pearls are largely made in France, Germany, and Italy. They are very well imitated by the scales of certain fishes, such as the bleak. A substitute for black pearls is found in close-grained hæmatite, not too highly polished, and pink pearls are imitated by turning small spheres out of the rosy part of the conch-shell.

Pearl Islands (Sp. *Arch. de las Perlas*), a Pacific archipelago, in the Gulf of Panamá, belonging to the Republic of Panamá. The principal islands are: Del Rey, San José, and Pedro Gonzales, but there are many others. The name is derived from the actively worked pearl-fisheries in surrounding waters.

Pearl Lore. It is uncertain at what period pearls first came into use as ornaments and charms. The ancient Egyptians collected in pre-Dynastic times freshwater pearl mussels from the Nile, and utilized their valves as receptacles for face-paint, &c. The Nile oyster (Ætheria) has been found in tombs of the Empire period. Pearls and pearl-shell were obtained from the Red Sea also. There is evidence to show that the Egyptians used pearl-shell for ornaments as early as the Sixth Dynasty. Petrie in his *Amulets* (London, 1914, p. 27) refers to Red Sea pearl-shells found in graves of the Twelfth Dynasty, and engraved with the name of Senusert I. Pearls were given a religious value and associated with the mother goddess. During the Empire period (*c.* 1500 B.C.) pearls were worn by Egyptian women with shells, coral, precious stones, gold, &c. Neck ornaments adorned with pearls were worn by both sexes. The extensive use of pearls in Egypt, however, dates from the Persian conquest. No doubt pearls were very expensive. They were obtained not only from the Red Sea but from East Africa. It is believed that King Solomon imported pearls from the north-east coast of Portuguese East Africa. At an early period pearls were obtained in the Persian Gulf. Pearls were used in Persia in the seventh century B.C. Assyrian monarchs depicted on bas-reliefs are seen to be adorned with them. Nose-rings with pearls were worn by Sassanian ladies. The Greeks and Romans attached a religious value to pearls. Homer's Juno wears " earrings of three drops " (*Iliad*, xiv, 183) which may have been pearls; the Persian women wore pearls in threes, and the Grecian men of rank wore, as did Persian noblemen, a pearl earring in the right ear. According to Pliny, pearls became very fashionable in Rome after the surrender of Alexandria. Pearls were used to decorate Roman temple altars. Julius Cæsar presented a breast-plate adorned with British pearls to Venus. This goddess, the Greek Aphrodite, personified a pearl in one of her phases, and was shown in human form sitting on a shell and being raised by sea-gods above the waves. Pearls were appreciated in ancient Britain. Fragments of pearl-shell have been found in the hand-made pottery of the early Britons. In Gaelic manuscript stories regarding Cuchullin that hero wears pearls in his hair. Freshwater pearls were searched for and used by Scandinavians and the peoples of Central Europe.

Pearls are referred to in ancient Hindu literature. Gods and human beings wore pearls and pearl-shell. According to the Sanskrit work *Atharvaveda* (*c.* 500 B.C.), pearls and pearl-shell ensured long life. Buddhists added to their stock of religious merit and power by accumulating pearls and precious stones. The pearl-fisheries of Ceylon, Madras, &c., are of considerable antiquity. Pearls were placed in the mouths of the dead in India when Marco Polo visited that country six centuries ago. The same custom obtained in China. Both in China and India ground pearls were used as medicine; it was believed that the 'life-giving pearl' would prolong life. In Old Persian the pearl was called *margan*, which signifies 'life-giver'. Pearls have long been fished for in Malaysia, Indonesia, and Polynesia. In these countries, as in China, pearls are connected with 'wonder beasts' of the dragon order. The Chinese dragon is closely associated with pearls. Like the Indian nagas (serpent deities), the Chinese dragons spit out pearls. 'Thunder pearls' are 'dropped from dragons' mouths'. Like jade, the pearl is supposed to be impregnated with *yang* (life-giving) substance, and there are Chinese literary references to "pearls of jade". The pearl was connected with the moon, and was supposed to shine in darkness. There are Chinese references to "the pearl of the moon", and to the moon as a "night-shining pearl". This connection between the pearl and heaven is found in Gaelic, *neamh* being the sky and *neamhnuid* the pearl. Both names are derived from the root *nem*. In Dante's *Paradiso* the moon is referred to as "the eternal pearl". The pearl was likewise connected with the moon by the pre-Columbian Americans. In India and Japan there are Buddhist legends about the "precious pearl which grants all desires". This pearl was obtained from a sea-dragon. Two magic jewels that caused the sea to flow and ebb were pearls. Pearls have been found in pre-Columbian graves in North America. The Mexicans, when first visited by the Spaniards, were found to be admirers of pearls, which they used to decorate their gods and temples, as did the Hindus, Romans, and others. In Peru the Incas used pearls as artificial eyes for their mummies, as the Egyptians formerly used pearl-shell. Many ancient peoples believed that pearls were congealed dewdrops, or that they were formed by drops of rain. The belief among early Christians that pearls originated from 'angels' tears' was evidently of pagan origin. In Scandinavia pearls, amber, precious stones, &c., were supposed to have originated from the tears of the goddess Freyja. The dragons of China which spat pearls were rain-producers. It was apparently because pearls were supposed to originate in life-giving water, or from tears of deities, that they were regarded as elixirs and used as medicine, and also as charms. When placed in the mouth of the dead, pearls were believed to facilitate their resurrection. The pearls worn by warriors were supposed to protect them. As the pearls radiated sacred influence, being of divine origin, the Buddhist habit of accumulating them, and the Roman habit of presenting them to deities, can be understood. De Groot, in his *The Religious System of China* (p. 136), states that pearls, jade, gold, &c., were supposed by the ancient Chinese to be "imbued with influences emitted from the heavens". The modern belief that pearls 'sicken' when the wearer falls into bad health is probably a survival from the time when pearls were regarded as 'life-givers'.

Pearl Stone, a glassy rhyolite with perlitic structure, that is, with minute curving cracks developed during cooling, which divide it into little globular bodies with a pearly lustre.

Pearson, John, English divine, born at Snoring, Norfolk, about 1613, died 1686. Educated at Eton and Cambridge, he took orders in 1639, and held successively the livings of Torrington in Suffolk, and of St. Clement Eastcheap, London. He became professor of divinity at Cambridge in 1661, and Bishop of Chester in 1672, and was considered one of the most learned Englishmen of his time. His chief work is an *Exposition of the Creed* (1659).

Peary, Robert Edwin, American Arctic explorer, born in 1856, died in 1920. He entered the United States navy in 1881, and after serving for a time as assistant engineer in connection with the surveys for the Nicaragua Ship Canal, made a voyage to Greenland and penetrated some distance inland. In 1891–2 he demonstrated that Greenland was an island. His second expedition to the north of that country took place in 1893–5, and he made other Arctic voyages in 1896 and 1897. In 1898 he set out on a fresh voyage of exploration in Greenland and the Polar seas, from which he returned in Sept., 1902, having reached 84° 17′ N. lat. He again set out in 1905, and in Nov., 1906, word was received from him that he had reached lat. 87° 6′, or within 203 miles of the North Pole, the highest latitude ever attained. On his next expedition he appears to have reached the Pole, or a point close to it, early in 1909. He published *Northward over the Great Ice*, a record of his Arctic work (2 vols., 1898); *Nearest the Pole* (1907); and *The North Pole* (1910).

Peasants' Revolt. The most notable social or class war in English history is the Peasants' Revolt of 1381. Its real cause was an attempt by landlords to solve the labour problem of this time by reimposing obligations of serfdom or villeinage, which was becoming obsolete, but the occasion was a poll-tax or Government impost per head of the population. Many parishes gave fraudulent returns of the numbers of inhabitants, so as to diminish the total assessment on the parish, and, consequently, the amount of each individual's payment. The frauds were discovered, and the tax was exacted with such severity that the peasants of Essex, Kent, Norfolk, Suffolk, and Cambridgeshire broke into rebellion, and marched to London in June, 1381. The young king, Richard II, agreed at Mile End to accede to their demands and to abolish serfdom, but the rebels were not satisfied, and there was a great riot in London, in which many houses were pillaged and burned, and the Archbishop of Canterbury and the Lord Treasurer were murdered. On the following day (14th June) there was another conference at Smithfield, in the course of which the rebel leader, Wat Tyler, was killed, and the boy-king declared that he himself would be their leader. While the conference was in progress, the Mayor of London brought troops and the rebels were surrounded. In spite of the royal promises, the rebellion was followed by very severe measures, and Parliament refused to abolish serfdom. Economic conditions continued to lead to its disappearance, but the revolt rather hindered than helped the process.—BIBLIOGRAPHY: Sir C. W. C. Oman, *The Great Revolt of 1381*; G. M. Trevelyan, *England in the Age of Wycliffe*.

Peasants' War, an insurrectionary movement among the German peasantry, which took place in 1522–5. The immediate cause of this movement was religious fanaticism, but the pent-up forces by which it was impelled grew out of the long course of oppression to which feudal customs and priestly tyranny had subjected the people. As in France before the Revolution, so in Germany at the time of the Reformation the double yoke of civil and ecclesiastic bondage had been growing heavier until it had become intolerable. The insurrection broke out in the Black Forest area, and soon spread over Franconia and Thuringia. The mobs destroyed convents and castles, pillaged and murdered, and were guilty of fearful and atrocious cruelties. Luther denounced the excesses of the peasants, and their army, under the command of Münzer, was overwhelmed at Frankenhausen (15th May, 1525) by the Landgrave Philip the Magnanimous of Hesse and dispersed. It is estimated that over 100,000 persons lost their lives in these risings, which for the time gave a severe blow to the Reformation. See *Jacquerie*.—Cf. E. B. Bax, *The Peasants' War in Germany* (*The Social Side of the Reformation*).

Peat, a kind of turfy substance consisting of vegetable matter which has accumulated by constant growth and decay in hollows or moist situations on land not in a state of cultivation, always more or less saturated with water, and consisting of the remains, more or less decomposed, of the mosses Sphagnum and Hypnum and other marsh plants. Peat is generally of a black or dark-brown colour, or when recently formed, of a yellowish-brown; it is soft and of a viscid consistence, but it becomes hard and darker by exposure to the air. When thoroughly dried it burns, giving out a gentle heat without much smoke; it is much used as fuel in those countries where it abounds, as in Scotland and Ireland. It often covers large areas, forming what are called peat-bogs, and in these the accumulation of solid peat may reach a great depth, sometimes 50 feet or more. When prepared for fuel in the ordinary way, it is dug from the bog in rectangular brick-like masses, which are set up to dry on the spot, and when sufficiently dried are carried away and stacked. Peat, as it is cut from the bog, contains from 80 to 90 per cent of water, and when air-dried the water still forms 15 to 25 per cent of its weight. To increase its value as fuel several methods for drying and condensing it have been employed. It is used as litter; as an absorbent and packing, fruits and vegetables being kept fresh by it; as a source of gas and paraffin; a material for woven fabrics, &c. See *Fuel*.

Peaucellier's Cell. See *Parallel Motion*.

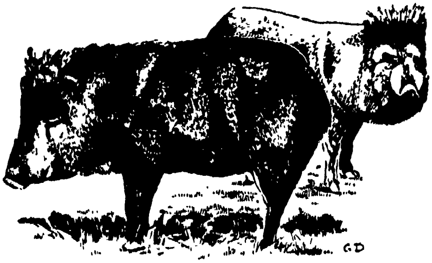
Peba, a species of the armadillo (*Tatusia novemcincta*) found in various parts of South America. Its flesh is much valued by the natives.

Pébrine, a French name for a destructive epizootic disease among silk-worms due to protozoan parasites, which swarm in the blood and all the tissues of the body, passing into the undeveloped eggs of the females, so that it is hereditary, but only on the side of the mother. It is contagious and infectious, the parasites passing from the bodies of the diseased caterpillars into the alimentary canal of healthy silkworms in their neighbourhood. Pasteur devised preventive measures, consisting in the destruction of eggs laid by infected moths.

Pecan′, or **Pecan-nut**, a species of hickory (*Carya olivæformis*) and its fruit, growing in North America. It is a large tree, with hard, very tough wood, pinnate leaves, and catkins of small flowers. The nuts are occasionally to be met with in British fruit-shops.

Pec′cary (Dicotyles), a genus of hoofed mammals, included in the Artiodactyle ('even-toed') section of that order, and constituting a distinct family (Dicotylidæ) closely allied to swine. These animals are exclusively confined to America, in which continent they represent the true swine of the Old World. In general form the peccaries resemble small pigs. The best-known species are the collared peccary (*Dicotyles torquātus*) and the white-lipped peccary (*D. labiatus*). The former occurs abundantly in

South America, and also extends into North America, living generally in small flocks, which do not hesitate to attack with their tusks anyone who meddles with them. Their food consists of maize, potatoes, sugar-canes, and similar materials; and cultivated fields suffer much from their raids. This species of peccary is readily domesticated. The flesh is savoury, and less fat than pork. The peccary possesses a glandular sac or pouch, situated in the loins, which secretes a strongly smelling fluid of fœtid nature. This must be cut away immediately on killing a peccary, to avoid contaminating the flesh.



Collared Peccaries (*Dicotyles torquātus*)

Pecop'teris, a genus of fossil ferns occurring from the Carboniferous to the Jurassic systems, named from the comb-like arrangement of the leaflets.

Pecos River, a river of the United States. It rises in New Mexico, flows through Texas, and enters the Rio Grande after a course of 750 miles.

Pecten, a genus of bivalve molluscs, the type of a special family (Pectinidæ) allied to oysters, and popularly designated under the name of ' scallop-shells '. Numerous species of pecten—180 or more—are known. The common pecten (*P. operculāris*) and the frill or great scallop (*P. maximus*) are the most common forms. The latter form is esteemed a delicacy, and as such is sold in the London markets. The shell of this species was borne in the Middle Ages by pilgrims in their hats, as a sign that they had visited the Holy Land. The shell is somewhat rounded, and terminates superiorly in a triangular ' ear ', in which the hinge exists. The name ' pecten ' (Lat. for ' comb ') is derived from the indentation of the edges and surfaces of the shell.

Pectinibranchiata, those sea-snails having comb-like branchiæ or gills, as the purple shells (Murex), whelk (Buccinum), cowries (Cypræa), &c.

Pec'tolite, a mineral consisting of hydrous calcium sodium silicate. It is a tough greyish or whitish mineral occurring in basic lavas, in aggregated crystals of a silky lustre, commonly arranged in radiated forms.

Peculiar, in canon law, a particular parish or church which has jurisdiction within itself, and exemption from that of the ordinary or bishop's court. The *Court of Peculiars*, in England, is a branch of the Court of Arches which has jurisdiction over all the parishes in the province of Canterbury which are exempt from the ordinary jurisdiction, and subject to the metropolitan only.

Peculiar People, or Plumstead Peculiars, a Protestant sect founded in 1838 by John Banyard, and found chiefly in Kent, England. They believe in the efficiency of prayer without the use of any efforts on their own part. In sickness they reject the aid of physicians, accepting *James*, v, 14, 15 in a strictly literal sense. They have also certain peculiarities of dress, &c. See *Faith-healing*.

Pedee', Great and Little, two rivers in the United States. The former rises in North Carolina, enters South Carolina, and falls into the Atlantic: total course, 360 miles, of which 200 miles are navigable for boats of 60 or 70 tons. Little Pedee rises in North Carolina, and enters the Great Pedee 32 miles above its embouchure.

Pede'tes (Gr. *pēdētēs*, a leaper), a genus of rodent mammals, of which the only species is *P. capensis* (the jumping-hare of South Africa). This constitutes a distinct family (Pedetidæ) related to the jerboas.

Ped'icel, in botany, the stalk that supports one flower only when there are several on a peduncle.

Pedicella'riæ, specialized spines attached to the skin or outer surface of star-fishes, sea-urchins, and other Echinodermata. Each pedicellaria consists essentially of a stalk attached to the organism, and bearing at its free extremity two or more movable blades or jaws, which open and close on foreign particles so as to retain them.

Pedicula'ris, an extensive genus of herbaceous perennials, chiefly European, of the nat. ord. Scrophulariaceæ. Two British species are common, *P. palustris* and *P. sylvatica*; they are herbs of brownish hue, with deeply divided leaves and showy pink flowers, growing in moist pastures, and commonly known as Lousewort.

Pedilan'thus, a genus of South American plants belonging to the nat. ord. Euphorbiaceæ, of which one species (*P. tithymaloides*), used medicinally in the West Indies, is known under the name of ipecacuanha, and is employed for the same purpose as that drug.

Ped'iment, in classic architecture, the triangular mass resembling a gable, above the entablature at the end of buildings or over porticoes. The pediment is surrounded by a cornice, and is often ornamented with sculpture. The triangular finishings over doors and windows are also called pediments. In the debased Roman style the same name is given to these same parts, though not triangular in their form. In the architecture of the Middle Ages small gables and triangular decorations over openings, niches, &c., are called pediments.

Pedipalpi, an order of arachnidans, comprising the whip-scorpions, and other unfamiliar forms.

Pedlars and Hawkers are itinerant dealers who carry their goods from place to place for sale. The Hawkers' Act (1888) defines a hawker as one who travels with a horse or other beast bearing or drawing a burden; the Pedlars' Act (1871) describes a pedlar as one travelling without a horse, &c. Certificates for the latter (5s. annually) are given by the chief officer of police of the district for which they are asked, to persons of good character, who must satisfy the officer they are seventeen years of age, have resided for one month in the district, and intend to carry on the business of a pedlar in good faith. These certificates may be extended to other police districts by endorsement of the chief of police, at a charge not exceeding sixpence for each endorsement. Hawkers' licences are granted by the excise, and cost £2 annually.

Pedom'eter, an instrument made in the form of a watch and carried in a pocket by a pedestrian, to enable him to know what distance he has walked. The mechanism consists of a heavy pendulum which receives an impulse every time a step is made, a spring to bring back the pendulum to its normal position, and a ratchet which is operated from the pendulum and gives motion to a train of wheels. The dial is graduated in miles and yards. The instrument should be tested by walking known distances and checking the readings. Adjustments of the length of the pendulum change the readings, and may be required before the instrument can be relied upon by the user.

Pedro II, Emperor of Brazil, born at Rio de Janeiro 1825, died in 1891. He succeeded to the throne on the abdication of his father, Dom Pedro I, in 1831, and married the Princess Theresa Christina Maria (died 1890), sister of Francis I, King of Naples, in 1843. Brazil prospered greatly under the rule of Pedro II, who did much to develop its resources in every direction. In 1871 he issued an imperial decree for the gradual abolition of slavery, which totally ceased in Brazil in May, 1888. He was deposed by the Revolution of Nov., 1889, and died at Paris.

Peebles, a royal and municipal borough of Scotland, the county town of Peeblesshire, on the Tweed; served by the North British and Caledonian Railways. It is an angling-resort; tweeds and other cloth are manufactured. The name is derived from the *pebylls* (tents) of the Gadeni which occupied the site in Roman times, and the town was long a favourite haunt of the Scottish kings, who hunted periodically in Ettrick Forest. It became a royal burgh in 1367 by charter of Alexander III. A notable building is the Chambers Institution, presented to the town in 1859 by William Chambers, the Edinburgh publisher. This building was originally the Queensberry Lodging, town house of the Earls of March, and was restored and enlarged by Andrew Carnegie during 1912. Pop. (1921), 6105.

Peeblesshire, or Tweeddale, an inland county of Scotland; area, 226,899 acres. The greater part of the surface consists of mountain, moor, and bog, and the main industry is sheep-farming. Highest summit, Broad Law, 2750 feet, near the south border. White and red freestone are common in the northern part of the county, and both coal and limestone have been wrought at various points. Peeblesshire is a great sheep-raising county. The Tweed is the only notable river, but its affluents include the Manor, Lyne, and Biggar. The Caledonian and North British Railways provide communications. With Midlothian Peeblesshire returns two members to Parliament. Pop. (1921), 15,330.—Cf. Sir H. Maxwell, *The Story of the Tweed.*

Peekskill, an industrial town of Westchester county, New York, United States, on Hudson River; served by the New York Central & Hudson River Railway, and by river-steamers. It was founded in 1764, and was incorporated in 1816. Pop. 15,250.

Peel, Arthur Wellesley, Viscount, youngest son of Sir Robert Peel, born 1829, died in 1912. He was educated at Eton and Oxford; was member for Warwick (1865–95); parliamentary secretary to Poor-law Board (1868–71); secretary to Board of Trade (1871–3); patronage secretary to Treasury (1873–4); under secretary for Home Department (1880); succeeded Sir Henry Brand in 1884 as Speaker of the House of Commons, retiring in 1895; was chairman of the Licensing Commission of 1896–1900, and drafted the minority report.

Peel, Sir Robert, British statesman, was born 5th Feb., 1788, near Bury, in Lancashire, died 2nd July, 1850. His father, who had raised himself from a comparatively humble station to be the largest cotton-manufacturer in the world, was created a baronet in 1800, and left behind him a fortune of nearly £2,000,000, of which the largest share was inherited by his eldest son Robert. Young Peel was sent to Harrow and Oxford, where he took his bachelor's degree in 1808, with double first-class honours. Immediately on attaining his majority he was elected member of Parliament for Cashel; in 1810 he became Under-Secretary of State for the Colonies; and from 1812 to 1818 he was Chief Secretary for Ireland. In 1817 he was elected as member for the University of Oxford. The following year he resigned his office in the ministry, of which he still continued to be a supporter, and began to take a leading part in the discussion of the difficult financial questions then pending. In 1822, under the Liverpool ministry, he became Home Secretary, and continued in this office till the dissolution. Refusing to take office under Canning, he joined the ministry of the Duke of Wellington in 1828 as Home Secretary. The principal act of this ministry was the passing of the Roman Catholic Relief Bill, which cost Peel his seat for Oxford. Peel also passed the New Metropolitan Police Act, which gave rise to the new nicknames Bobbies and Peelers for the London police. In 1830 he succeeded his father as baronet. At the close of this year the ministry resigned in consequence of the increasing agitation for parliamentary reform, and was succeeded by the reform ministry of Earl Grey. Peel strenuously opposed the Bill, but after it became law he declared his intention frankly to accept it, and began vigorously to prepare his party for the change in its circumstances. In the election of 1832 he was returned for Tamworth, for which he continued to sit during the remainder of his life. On the dismissal of the Whig Government in 1834 Peel undertook the government, but his party in the House being in a minority, the task was hopeless. After a brief struggle the ministry resigned, and was succeeded by the Whig ministry of Lord Melbourne, which lasted from 1835 to 1841. The general election of 1841 gave a large majority to Sir Robert Peel, and the formation of a Conservative ministry could no longer be delayed. There was a strong agitation for the repeal of the corn-laws, but Peel himself was in favour of a modification of the sliding scale of duty which had existed since 1828. Other measures of the session of 1842 were the imposition of an income-tax for three years, and a revision of the tariff. In 1844 and 1845 he passed his celebrated English and Scotch Banking Acts. During the recess in 1845 the potato-rot and famine in Ireland brought the question of the corn-laws to a crisis, and Peel declared in favour of their total repeal. The Act repealing the corn-laws (after a modified duty for three years) was passed on 26th June, 1846. On the same day the ministry was defeated in the House of Commons on the Irish Coercion Bill, and on the 29th of June Sir Robert Peel resigned. On 29th June, 1850, he was thrown from his horse, and received injuries of which he died three days later. By his will he renounced a peerage for his family, as he had before declined the Garter for himself. In his private capacity Sir Robert Peel was a generous patron of literature and art, and his collections of pictures were somewhat celebrated.—BIBLIOGRAPHY: T. Doubleday, *The Political Life of Sir R. Peel*; J. R. Thursfield, *Peel* (in Twelve English Statesmen Series); F. P. G. Guizot, *Sir Robert Peel: étude d'histoire contemporaine.*

Peel, an ancient seaport, town, and watering-place on the west coast of the Isle of Man; served by railway from Douglas and by road. There is an extensive fishing industry. On St. Patrick's Isle, joined to the mainland by a causeway, stands the ruin of Peel Castle, and the roofless remains of the cathedral of St. German's. The castle is mentioned by Sir Walter Scott (Fenella's Tower, &c.) in *Peveril of the Peak*. Among notable prisoners of Peel were the Earl of Warwick (1397) and the Duchess of Gloucester (1444). The name is of Keltic origin, meaning 'fort', e.g. 'peel-towers' (q.v.) of the Scottish borderland derive their name from the same source. Pop. 3920.

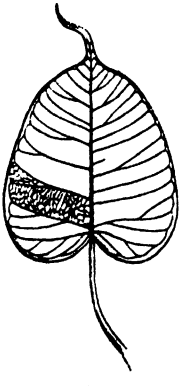
Peele, George, English dramatist and poet, was born in London in 1558, and died in or before 1598. His father was clerk of Christ's Hospital, and an able man with original views about book-keeping. Peele was educated at Christ's Hospital and at Broadgates Hall (now Pembroke College), Oxford; he migrated, however, to Christ Church, whence he graduated B.A. in 1577 and M.A. in 1579. After leaving Oxford he led a Bohemian life in London, and was a friend of Greene, Nash, and Marlowe. He married, in 1583, a lady of property, but did not become any more sober in his mode of living. Little more is known of his life, but he died before Sept., 1598, when Francis Meres, in his *Palladis Tamia*, wrote, "As Anacreon died by the pot, so George Peele by the pox". Some nine years after his death there appeared a collection of *facetiæ* entitled *Merrie conceited Jests of George Peele*. Some of these jests are much older than Peele, but some passages are biographical. Upon one of these stories is based *The Puritan, or the Widow of Watling Street*, a play sometimes misattributed to Shakespeare. Its hero, George Pyeboard, is Peele himself ('peel' is a baker's board for shoving pies in and out of the oven).

Peele's pastoral comedy *The Araygnement of Paris* appeared about 1581. It is a graceful play, full of skilful flattery of Queen Elizabeth. *King Edward I* (to reduce its lengthy title to a reasonable compass) is a chronicle-history which misrepresents Queen Elinor because she was a Spaniard. It probably appeared soon after the defeat of the Armada. *The Battell of Alcazar* is a vigorous play which is probably by Peele. *The Old Wives' Tale* is one of the most amusing of Peele's plays. It is usually considered to be a skit upon romantic drama, and so a forerunner of *The Knight of the Burning Pestle*; but some critics consider that it exemplifies rather than satirizes a certain kind of folly. *The Love of King David and Fair Bethsabe* (1588) owes its plot entirely to the Old Testament, and was probably written as a counterblast to those who charged the drama with lack of respectability. Fleay credits (or perhaps it would be more correct to say discredits) Peele with the authorship of *The Wisdom of Doctor Doddipoll*, *Wily Beguiled*, and *The Life and Death of Jack Straw*.

Peele had not the natural gifts that a dramatist should have; his very considerable gifts were purely poetical. He wrote plays simply to make a livelihood; he had no literary conscience, and something of the university man's contempt for his uneducated audience. *The Old Wives' Tale* probably gives his views upon contemporary drama. He could not handle a plot, or a dramatic situation. His work, however, is full of variety and interest, and he has a real gift for musical effect. His poems contain some beautiful passages, of which the best known is:

> His helmet now shall make a hive for bees,
> And lovers' songs be turned to holy psalms;
> A man at arms must now serve on his knees,
> And feed on prayers, which are old age's alms.

—Bibliography: G. C. Odell, *Peele as a Dramatist* (*The Bibliographer*, vol. ii, 1908); Sir A. W. Ward, *English Dramatic Literature*; J. A. Symonds, *Shakspere's Predecessors*.



Leaf of Peepul

Peel-tower, or simply **Peel**, the name given on the Scottish borders to small residential towers erected for defence against predatory excursions. They were usually square buildings with turrets at the angles. The lower part was vaulted, and served for the accommodation of horses and cattle. See *Peel*.

Peep-o'-day Boys, an organization of Protestant Ulstermen formed in Ireland in 1784, shortly after the volunteer movement. They were so named from visiting the houses of the 'defenders', their antagonists, at daybreak in search of arms.

Peepul, Pipul, or Sacred Fig (*Ficus religiosa*), a species of fig tree common in India, and held sacred by the Hindus and Buddhists. Its leaves are heart-shaped on long stalks. It attains a great age, and is usually planted near temples, where it affords shelter to the devotees. Vishnu is said to have been born under a peepul tree. Its fruits are edible, but not much esteemed.

Peer (Fr. *pair*, from Lat. *par*, equal), literally an equal, one of the same rank and station. In this sense it is used by the common law of England, which declares that every person is to be tried by his peers. Peer also signifies in Britain a member of one of the five degrees of nobility that constitute the *peerage* (duke, marquess, earl, viscount, baron). The dignity and privileges of peers originated with the growth of the feudal system, the peers being originally the chief vassals holding fiefs directly from the Crown, and having, in virtue of their position, the hereditary right of acting as royal counsellors. Subsequently not all the Crown vassals appeared at court as advisers of the king, but only those who were summoned to appear by writ. This custom grew at length into a rule, and these summonses were considered proofs of hereditary peerage. Peers are now created by letters patent. The British peerage collectively consists of peers of England, of Scotland, of Great Britain, of Ireland, and of the United Kingdom, but only a portion of the Scottish and Irish peers are peers of Parliament. A peerage may be limited to sons and their descendants, or extended by special remainder to daughters or a brother. Women can be peeresses in their own right, but in 1922 failed to establish their right to sit in the House of Lords. See *Britain*; *Nobility*; *Parliament*.

Peg'asus, in Greek mythology, a winged horse, said to have sprung from the trunk of Medusa. Bellerophon made use of Pegasus in his fight with the Chimæra. With the stroke of his hoof Pegasus called forth the sacred well Hippocrene, on Mount Helicon, from which he was in later times called the horse of the muses.

Pegasus, in zoology, a genus of small spiny-finned fishes inhabiting the Indian Ocean and Western Pacific.

Peg'matite, a coarse granite rock occurring as veins, composed mainly of potassium felspar and quartz, typically intergrown with each other. It is used in the manufacture of porcelain.

Pegu, a division, district, and town of Burmah. The division of Pegu comprises the districts of Rangoon (city), Hanthawadi, Pegu, Prome, and Tharrawadi, east of the Irawadi River. Area, 13,000 sq. miles; pop. about 2,000,000. — The district of Pegu was formed in 1883, and extends between the Sittang River (west side) and the Pegu Yoma range. Rice is produced in large quantities, and is the only agricultural product. Area, 4280 sq. miles; pop. about 350,000.—The town of Pegu stands on Pegu River, and is a junction for Moulmein and Mandalay on the railway from Rangoon. It was formerly the capital of Lower Burmah, and is supposed to have been founded in A.D. 573 as first capital of the Talings. During both first and second Burmese Wars it was the scene of considerable fighting. Pop. 17,100. The Pegu River rises in the Pegu Yoma range, and joins the Rangoon River below Rangoon City after a course of 180 miles. The Pegu Yoma range extends roughly north and south for some 200 miles between the Sittang and the Irawadi. The maximum elevation is about 2000 feet. In the afforested slopes and valleys teak and other valuable timbers are found.

Pei-ho (pe-i-hō′), a river of Northern China, rises near the Great Wall, and flows south-east to the Gulf of Chih-li, which it enters after a course of about 280 miles. The Pei-ho system has a drainage area of over 50,000 sq. miles. At its mouth is the small town of Taku, with several forts, which were captured by an Anglo-French force on 20th May, 1858, and again on 21st Aug., 1860, and were finally stormed by European and Japanese troops on 17th June, 1900.

Peine Forte et Dure (pen fort e dür), a punishment formerly inflicted upon a prisoner who refused to plead guilty or not guilty when put on trial for felony. He was put into a low dark chamber, and laid on his back naked, on the floor. As great a weight of iron as he could bear was then laid upon him until he died or answered.

Peipus (pe′i-pụs), or **Chudskoe Ozero**, a lake of Russia, between Russia, Esthonia, and Livonia, comprising three distinct basins (Peipus Proper, Pskov, and the Warm Lake), with a total length of 90 miles and an area of 1356 sq. miles. It discharges by the Narova into the Gulf of Finland. The fisheries are valuable.

Pekan′, a species of marten (*Mustēla pennanti*) nearly allied to the sable, found in woody regions of North America from lat. 35° to 65°. It attains a length of from 3 to 4 feet; feeds on mice, frogs, fish, &c., and is valued for its fur.

Pekin, a city of Illinois, United States, the county seat of Tazewell county, on the Illinois River; served by the Atchison, Topeka, & Santa Fé, the Illinois Central, and by six other railways. It is an agricultural centre, a shipping point within the Illinois coal-fields, and an industrial, transport, and trading city in general. Pekin was settled in 1830, and was incorporated in 1839 and 1874. Pop. 12,000.

Peking′ (' northern capital ' as opposed to Nanking), capital of the Republic of China, in the province of Chih-li, about 40 miles from the Great Wall, and 100 miles from the Gulf of Chih-li; served by the Peking-Mukden Railway. The entire circuit of the walls and suburbs of Peking is reckoned at 30 miles. There are in all sixteen gates leading into the city, each protected by a semicircular enceinte, and a higher tower built in galleries. The city consists of two portions, the north or Tartar city, and the south or Chinese city. The former is built in the shape of a parallelogram, and consists of three enclosures, one within the other, each surrounded by its own wall. The Government offices are situated in the Tartar city, which also contains the foreign legations. The Tartar city really consists of a number of cities, with the former Forbidden City in the centre, which is surrounded by the Hwang, or Imperial City. In the Chinese city broad straight streets run from gate to gate, intersecting each other at right angles, but they are unpaved, and in rainy weather impassable from mud. Amongst the principal public buildings of Peking are the Temple of Eternal Peace, belonging to the lamas; the Mahommedan mosque; the observatory; the Temple of Agriculture and the Temple of Heaven (1421). Peking has little or no trade except that which is produced by the wants of its population.

For nearly 1000 years Peking has existed as an important city under different names and in various hands. It became capital of the Chinese Empire in 1403, and has been the capital city of all China, Imperial and Republican, since that time. During the Boxer risings and the siege of the legations (1900) Peking suffered severely, and politically the city passed through anxious days in course of the 1911 Revolution and the subsequent accession of Yuan-Shih-Kai to supreme presidential power. In May, 1922, the disruption of China seemed assured, and Canton, governed by Dr. Sun Yat Sen, threatened to supplant Peking as the Chinese capital. Under Wu-Pei-fu the armies of Chih-li entirely defeated the pro-Japanese forces of Marshal Chang-Tso-lin, and compelled his retirement from the capital to Manchuria, where he set up an opposition government, but left unshaken the power of Peking as capital city and the key to China. Pop. over 2,000,000 (including 2000 foreigners). —Cf. Juliet Bredon, *Peking*.

Pela′gius, British theologian, author and systematizer of the doctrine known as Pelagianism. His name is supposed to be a Græcized form of the Cymric Morgan (sea-begotten). He was not a monk, but he adhered to monastic discipline, and distinguished himself by his sanctity and purity of life. He came to Rome in the beginning of the fifth century, and is there said to have learned the opinions afterwards identified with his name from a monk Ruffinus, whose teaching was founded on that of Origen. In A.D. 410, during Alaric's third siege of the city, he escaped with his convert and pupil, Cœlestius, to Northern Africa, and had gone from there to Palestine before the meeting of the Council of Carthage (411–12) which condemned Cœlestius. In Palestine he lived unmolested and revered until 415, when Orosius, a Spanish priest, came from Augustine to warn Jerome against him. The result was that he was prosecuted for heresy, but two councils (at Jerusalem, and at Diospolis, the ancient Lydda) pronounced him orthodox. He was subsequently expelled from Jerusalem, however, in consequence of condemnations by the Council of Carthage in A.D. 417 and 418, and by a synod held at Antioch in A.D. 421. Nothing is known of his subsequent career. His doctrine, known as Pelagianism, included a denial of original sin or the taint of Adam; the maintenance of the doctrine of free-will and the merit of good works; and of the power in man to receive or reject the gospel. The promulgation of his views by Pelagius was nearly simultaneous with that of the orthodox theory of original sin, &c., by Augustine, and in the development of his doctrine Augustine was influenced by his opposition to Pelagianism. A doctrine subsequently distinguished as *semi-Pelagianism* was taught by John Cassian, a monk of Constantinople, ordained a deacon by Chrysostom in 403. Semi-Pelagianism was also condemned. The term 'Pelagianism' has been continued to modern times to denote views which minimize the effects of the fall and unduly exalt man's natural ability.—Cf. R. G. Parsons, article in Hastings's *Encyclopædia of Religion and Ethics.*

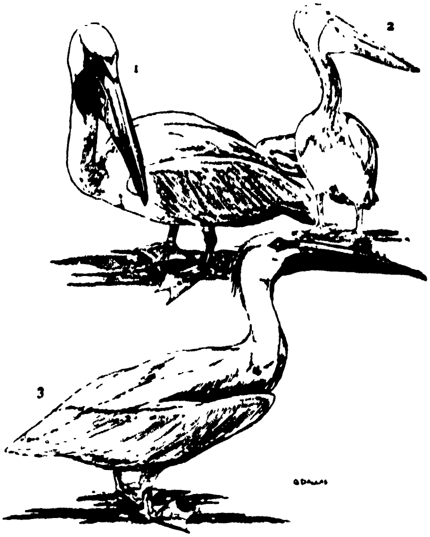
Pelas'gians, a prehistoric race widely spread over the whole of Greece, the coasts and islands of the Ægean, and also in Asia Minor and Italy. The Pelasgians are mentioned by Homer, who speaks of them as dwelling in Argos and in Epirus. Hesiod mentions Dodona as their seat, whilst Strabo speaks of them as an ancient tribe spread over the whole of Hellas. Some writers regarded them as a great and widely spread people, inhabiting all the countries from the Po to the Bosporus, and supplying a common foundation to the Greek and Latin peoples and languages. Other writers, however, receive the entire tradition of the Pelasgians with scepticism. One view is that they were the earliest Hellenic inhabitants of Greece. Another is that they belong to the Mediterranean or Brown race, who preceded the Hellenes or Greeks in Greece, and attained an advanced civilization. Various monuments and remains found in Italy, Greece, and Asia Minor have been attributed to them. The monumental remains belong to the style of architecture called Cyclopean.

Peleus (pē'lūs), in Greek mythology, son of Æăcus, King of Ægina. After many adventures he became master of a part of Thessaly, and married the nymph Thetis, by whom he became the father of Achilles. The nuptials were celebrated on Mount Pelion, and honoured with the presence of all the gods except Eris, the goddess of discord.

Pelew', **or Palau Islands**, a group belonging to the Caroline Archipelago, in the North Pacific Ocean. They are twenty-six in number, and lie within a coral barrier reef. The southern islands are of coralline formation; the northern are volcanic. They are healthy climatically, but many are uninhabited. Babeltop is the largest island. The inhabitants are of Micronesian origin. Phosphates, copra, bêche-de-mer, and tropical fruits are produced.

The Pelew Islands were sighted by Villalobos (1543) and named the Arrecifos. Prior to the European War they belonged to Germany, who had acquired the group from Spain in 1899, but during the war they were occupied by the Allies. By the Treaty of Versailles the islands are now administered by Japan as mandatory power. Area, 200 sq. miles; pop. 10,000 (including 1 European, 206 Japanese, and 4598 natives). See *Yap.*

Pel'ican, the name of several web-footed birds of the genus Pelecānus, constituting a distinct family (Pelicanidæ). They are larger than the swan, have a great extent of wing, and are excellent swimmers. Pelicans are gregarious, and frequent the neighbourhood of rivers, lakes, and the sea-coast, feeding chiefly on fish, which they capture with great adroitness. They have a large flattened bill, the upper mandible terminated by a strong hook, which curves over the tip of the lower one; beneath the lower mandible, which is composed of two flexible, bony branches



Pelicans

1, White Pelican. 2, Australian Pelican.
3, Saw-billed Pelican.

meeting at the tip, a great pouch of naked skin is appended, capable of holding a considerable number of fish, and thus enabling the bird to dispose of the superfluous quantity which may be taken during fishing expeditions, either for its own consumption or for the nourishment of its young. The species are found in Europe, Asia, Africa, and America. They sometimes perch upon trees; the nest is of rough construction, usually placed close to the water. The common or white pelican (*P. onocrotălus*) is coloured a delicate white, tinged with rose or pink. The young birds are fed by the parents with fishes from the pouch, and the males are said to feed the incubating females in a similar manner. The common pelican inhabits Europe, Asia, and Africa. About the middle of September flocks repair to Egypt. During the summer months they take up their abode on the borders of the Black Sea and the shores of Greece. They are rare in France and unknown in Britain. The pelican is not only susceptible of domestication, but may even be trained to fish for its master.

Pe'lion, a mountain of ancient Greece, in Thessaly, near the sea, 5300 feet high. In the war of the Titans with the gods the former, say the poets, piled Pelion upon Ossa to aid them in climbing to Olympus.

Pélissier (pā-lēs-yā), Jean Jacques Aimable, Duc de Malakoff, Marshal of France, was born in 1794, died in Algeria 1864. Educated at La Flèche and St. Cyr, he served in Spain (1823), in the Morea (1828–9), and in Algeria (1830–55). In 1855 he succeeded Canrobert as commander-in-chief of the French army in the Crimea, and took part in the siege of Sebastopol. He received the marshal's baton, and an annual pension of 100,000 francs. Ambassador to England (1858), he was appointed Governor-General of Algeria (1860).

Pella, ancient capital of Macedonia, and the birth-place of Alexander the Great. It surrendered to Paulus Æmilius 168 B.C., and from a large and magnificent city it sunk, under the Romans, to a mere station.

Pellag'ra is a chronic endemic disease, the true cause of which is not yet definitely ascertained. The symptoms, which are referred chiefly to the skin, the intestinal tract, and the nervous system, are always most marked in the spring and autumn months, and are in abeyance during the winter months. It is widespread in Southern Europe and North Africa, and affects mostly agricultural workers of a poor class, whose dietary is limited. It does not appear to be communicable from man to man. The theory of its cause which has had most support is that it is due to the consumption of diseased maize, but recently the food-deficiency theory has been put forward, and it has been demonstrated that there is a deficiency of certain elements of diet in many pellagrins. The facts that it occurs commonly in an impoverished population and is increased by war conditions support this view. The prognosis is always serious, and it is estimated that the death-rate from the initial attack is about 15 per cent. The duration of the disease is very protracted, and though obstinate cases may recover, relapses are common.

Pellia, a genus of Liverworts, belonging to the group Jungermanniales, but having a flat lobed thallus instead of the leafy shoot which is more typical of that section. *P. epiphylla* is very common on wet banks, walls, &c.

Pel'lico, Silvio, Italian poet and patriot, born 1788 at Saluzzo, in Piedmont, died in 1854. By his tragedies of *Laodamia* and *Francesca da Rimini* (represented in 1818) he earned an honourable place among Italian poets. In the same year, with Manzoni and others, he established the periodical *Il Conciliatore.* In consequence of the liberal spirit displayed in his productions he was in 1820, along with several of his friends, arrested on the charge of belonging to the Carbonari, and in 1822 was condemned to death, but the sentence was commuted to imprisonment in the Austrian prison of the Spielberg for fifteen years. In 1830 he was set at liberty. Pellico has given a most interesting account of his ten years' sufferings in *Le Mie Prigioni* (My Prisons), which has been translated into many languages. His tragedy *Francesca da Rimini* (1818) was greatly admired by Lord Byron, whose *Manfred* Silvio Pellico translated into Italian.

Pel'litory, or Spanish Chamomile (*Anacyclus Pyrethrum*), a plant nearly resembling chamomile, of the same order and belonging to an allied genus, a native of the Levant and of Southern Europe. It was introduced into England in 1750, and is chewed to relieve toothache and rheumatism of the gums. A genus of plants (Parietaria) of the nettle order is also known as pellitory, or wall-pellitory. The common wall-pellitory (*P. officinālis*) is a herbaceous perennial, with prostrate or erect branched stems, ovate leaves, and small flowers. It contains nitre, and was formerly used as a diuretic.

Pelop'idas, in ancient Greek history, a Theban general and statesman who lived in intimate friendship with Epaminondas. The supremacy of the Spartan faction in Thebes forced Pelopidas, with other exiles, to take refuge in Athens, but he returned in 379 B.C., and succeeded in overthrowing the Spartan party and recovering the citadel of Thebes. In the war which followed with Sparta Pelopidas distinguished himself in the battle of Tegyra (375) and of Leuctra (371), by which Thebes became for a time the leading power of Greece. In 364 he was sent against Alexander of Pheræ, tyrant of Thessaly, whom he defeated in the battle of Cynoscephalæ, though he himself was slain.

Peloponne'sus (Gr., 'Island of Pelops'), the peninsula which comprehends the most southern part of Greece, generally called the Morea. The Peloponnesus was conquered some time after the Trojan War by the Heraclidæ, or descendants of Hercules. Peloponnesus was anciently divided into six states: Messenia, Laconia (Sparta), Elis, Arcadia, Achaia, and Argolis, to which some add Sicyon. See *Greece.*

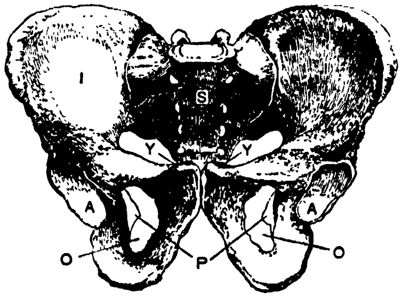
Pe'lops, in Greek mythology, son of Tantalus, King of Lydia. He married Hippodamia, a daughter of King Œnomaus of Elis, and succeeded his father-in-law in that kingdom. Peloponnesus received its name from him. Of his sons, Atreus and Thyestes are most celebrated.

Pelo'ria (Gr. *pelōr*, a monster), in botany, the appearance of regularity of structure in the flowers of plants which normally bear irregular flowers, instances of which occur in the snapdragon and the toad-flax, which being normally irregular, assume a symmetrical form.

Pelu'sium (the 'Sin' of the Scriptures), a city of ancient Egypt, situated on the eastern arm of the Nile delta, about 2½ miles from the sea, near the modern Damietta. It was called by the Egyptians Peremoun, which signifies mud-city. Manetho mentions its original name as *Abaris*, or *Anaris.*

Pelvetia, a genus of Brown Algæ, family Fucaceæ. *P. canaliculata* is a small wrack abundant about high-water mark on rocky coasts.

Pelvis (Lat. *pelvis*, a basin), the bony basin formed by the 'haunch-bones' and sacrum of Vertebrata, which constitutes the girdle or arch giving support to the lower or hinder limbs. The pelvis thus corresponds to the shoulder-girdle of the upper- or fore-limbs; and forms a cavity or basin in which several of the abdominal viscera, and organs relating to reproduction and the urinary functions, are protected and contained. The pelvis consists of four bones, the front and sides being formed by the two *ossa innominata* or innominate bones, and the circle being completed behind by the *sacrum* and the *coccyx.* Each innominate bone consists in early life of three pieces termed *ilium*, *ischium*, and *pubis*, and they meet in front at the *symphysis pubis.* The pelvis of man differs materially from that of woman, the differences having chiefly reference to the greater capacity required for the womb during pregnancy, and for the expulsion of the child at birth. It also varies somewhat in the different races of men.



Pelvis

I, I, Ilium. S, Sacrum. A, A, Acetabulum. O, O, Obturator foramen. Y, Symphysis pubis. P, Ischium. The coccyx at the end of the sacrum is not shown.

Pemba, an island of the Indian Ocean, off the Tanganyika coast, forming part of the Sultanate of Zanzibar, from which it lies 30 miles to the north-east, in 5° s. lat. It is 40 miles long by 10 miles broad, and has an area of 380 sq. miles. See *Zanzibar* and *Pemba.*

Pem'berton, a district of Wigan, Lancashire; served by the Lancashire & Yorkshire Railway. From 1894 it was a separate urban district, but became a part of the county borough of Wigan in 1904.

Pem'brey, a seaport of Carmarthenshire, South Wales, on the Burry inlet, 5 miles west of Llanelly; served by the Great Western Railway. There are dock and harbour accommodation, tin- and copper-works, and a large transit trade in coal. A complete mobilization of industry was effected for the manufacture of munitions during the European War.

Pem'broke, a municipal borough and seaport of South Wales, capital of the county of the same name, on a creek on the southern side of Milford Haven; served by the Great Western Railway. On the west side are the ruins of the mediæval castle of Pembroke, the remains of which give evidence of its former magnificence. On the north-west side is Pembroke Dock, otherwise called Pater, a small village until 1814, when the royal dockyard for the construction of ships of war was removed thither from Milford Haven. The town has now but little trade beyond that connected with the Government dockyard, which comprises an area of about 90 acres, and is strongly fortified. Pop. (1921), 15,481.

Pembroke College, Cambridge, a college founded in 1347, under the name of Valence-Mary, by Mary de St. Paul, widow of Aymer de Valence, Earl of Pembroke. The chapel, which is Corinthian in style, was built by Sir Christopher Wren in 1668, and enlarged in 1880 by Sir Gilbert Scott. Among the most noted members of the college may be mentioned Ridley the martyr, Archbishop Whitgift, Spenser and Gray the poets.

Pembroke College, Oxford, originally Broadgates Hall, was founded in the year 1624 by James I, and obtained its name from William Herbert, Earl of Pembroke. Shenstone, Blackstone, and Dr. Johnson were Pembroke men.

Pembrokeshire, a maritime county of Wales; area, 393,003 acres. Its coast-line is deeply indented, and in the south is the harbour of Milford Haven. The surface is generally undulating, and greatly diversified with hills and dales. Lead, iron, slate, and coal are worked. In the south part the limestone and Old Red Sandstone formation afford soils of excellent quality, but in the coal and slate districts the land is very inferior. Chief towns: Haverfordwest, Pembroke, and Tenby. Pop. (1921), 92,056.

Pem'mican, originally a Cree (North American) Indian preparation consisting of the lean portions of meat dried by the sun or wind, and then pounded into a paste and tightly pressed into cakes. It is extensively used in Polar expeditions on account of its smallness of bulk and good keeping properties.

Pem'phigus is the name given to a group of skin diseases, all characterized by the formation of bullæ (blisters), but varying considerably in their course and result. Acute malignant pemphigus is an acute infectious disease, usually following a septic wound in the hand, and its onset is marked by rigors, high temperature, sickness and diarrhœa, and a widespread bullous eruption. It has a high mortality. Chronic pemphigus is characterized by the formation of blisters upon healthy skin. It is slowly progressive, and often ends fatally. The blisters at first contain clear fluid, but may suppurate, and the surrounding skin then shows a red halo. Along with the skin eruption there is wasting and debility, and, at each fresh outbreak, a general feverish attack. Pemphigus foliaceus is a form of the disease where the bullæ are flaccid, and in which there is a general shedding of the skin. It frequently follows the chronic variety, but the symptoms are more severe, the eruption more widespread, and the fatal result much earlier. Pemphigus pruriginosus differs from the other forms in being attended with intense itching. It shows a great tendency to recur, but beyond the effects of the intense itching and pain, there is no disturbance of the patient's general health.

Pen (Lat. *penna*, pen, feather), an instrument for writing with a fluid ink. Pens of some sort have been in use from very early times, adapted to the material on which the characters were to be inscribed. The metallic stilus for the production of incised letters was probably the earliest writing implement. It was used by the Romans for writing on tablets coated with wax; but both they and the Greeks also used what is the true ancient representative of the modern pen, namely, a hollow reed, as is yet common in Eastern countries. It has been asserted that quills were used for writing as early as the fifth century A.D. In Europe they were long the only writing implement, the sorts generally used being those of the goose and swan. Up till the end of the first quarter of the nineteenth century these formed the principal materials from which pens were made. In 1808 Wise produced steel pens of a barrel form, mounted in a bone case for carrying in the pocket. They were of indifferent make, and, being expensive, were very little used. Joseph Gillott commenced the manufacture about 1820, and succeeded in making the pen of thinner and more elastic steel, giving it a higher temper and finish. Shortly afterwards Josiah Mason approached James Perry, a London stationer and pen-maker, and offered to manufacture steel pens for him which would be stamped with the seller's, not the manufacturer's, name. Perry accepted this offer, and Mason started his works and was able to produce better pens than other makers, through devising improvements in machinery and processes until the excellent pen-nibs we know to-day were the standard article of manufacture. In the modern process cast steel is rolled to the requisite width, and the blanks are stamped out and names embossed upon them. The blanks are then heated again and formed to their curved shape. The nibs are tempered by heating and afterwards quenching in oil. The slit in the pen is cut with very sharp-edged tools. The pens are then scoured, polished, and packed ready for the market. The century from the introduction of Gillott's first pen witnessed the reduction to a thousandth part of the original price of steel pens. Birmingham is the principal centre of the steel-pen industry, and the university of that city stands as a memorial to the successful life of Sir Josiah Mason.

Gold pen-nibs tipped with iridium or its alloy with platinum are in extensive use in fountain-pens. Joseph Bramah (q.v.) invented this type of pen. Ink is contained in a reservoir in the barrel of the pen, and passes to the nib through a capillary tube, the space it previously occupied being filled with incoming air. The size of the tube and the form of the 'feed' are the most important features in a fountain-pen. Self-filling pens have rubber tubes which can be emptied of air by operating a device which compresses the tube, and then filled with ink by placing the end of the pen into an ink-pot and relieving the pressure on the tube. Another form makes use of a small piston which is operated to draw in a barrelful of ink. Stylograph pens have a wire passing through a hole in the pen-point. The hole is bushed with a thin metallic tube, and the wire has at the end a piece of iridium or platinum-iridium wire. The wire inside the barrel has the form of a spiral spring.

Penal Servitude, in Britain, a punishment for criminal offences, ranging from five years up to the life of the convict. It was substituted for transportation when that punishment was abolished (1857).

Penance (Lat. *pœnitentia*, repentance), in theology, a self-imposed or accepted punishment, by which a repentant sinner expresses his sorrow for sin and seeks to atone for it. The idea of penance was already familiar to heathen nations, and the unnatural austerities of the Hindus may be said to furnish a striking example of penance. In the early Christian Church penances were of three kinds—secret, public, and solemn. The first consisted of such actions as are commonly imposed by confessors at the present day, as the repetition of certain prayers, &c. Public penance was in use from the earliest days of the Church. It was often very severe, and the penitents had to make a public confession of their sins in the Church. It became gradually the custom of the bishops to commute the canonical penances for pious works, such as pilgrimages, alms-deeds, and other works of charity—and these again were exchanged for indulgences. In the Roman Catholic Church penance is one of the seven sacraments. The matter of it consists of the three acts of the penitent: (1) contrition, or heartfelt sorrow for sin as being an offence against God; (2) confession to an authorized priest; and (3) satisfaction, or the acceptance and performance of certain penitential works in atonement of the sin; and the form of the sacrament is the sentence of absolution from sin pronounced by the priest who received the confession, and has been satisfied of the earnest repentance of the sinner. According to the doctrine of the Protestants there is no such sacrament; they consider repentance and faith as the only requisites for forgiveness.

Penang′, the most northerly division of the British Crown colony of the Straits Settlements. It consists of Penang Island and Province Wellesley on the opposite shore of the mainland. Penang is situated at the north entrance of the Straits of Malacca, off the west coast of the Malay Peninsula. Area of Penang, 108 sq. miles; total area, 280 sq. miles. Two-fifths of Penang is plain, and the rest hills—for the most part wooded—which rise to a height of 2734 feet in the peak now used as a sanatorium. The climate is hot, but very healthy. The island produces coco-nuts and areca-nuts, nutmegs and cloves, rice, sugar, coffee, and pepper. Georgetown, or Penang, is the capital and port of the settlement. The harbour is the strait between island and mainland. Penang was made over by treaty to the East India Company in 1785 by the Raja of Kedah, and with Province Wellesley, a long strip of the Malay Peninsula opposite, it now forms one of the Straits Settlements, having a resident Councillor to control administration. Pop. (1921) of Penang, Wellesley, and the Dindings, 304,572.

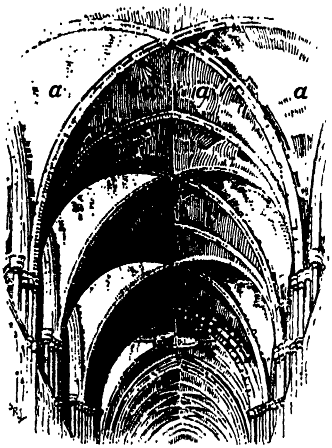
Penarth′, an urban district and seaport of Glamorganshire, South Wales, on the Ely, opposite Cardiff; served by the Taff Vale Railway. Penarth was an obscure village until the extension of its tidal harbour (1884), which has made it an important shipping-port for the minerals of South Wales. It is frequented in summer as a bathing-place and seaside-resort. Pop. in 1911, 15,488; in 1921, 17,097.

Pena′tes, Roman gods of the store-room and kitchen. The images of these gods were kept in the penetralia, or central part of every house, each family having its own Penates and the state its public Penates. The Lares were included among the Penates, but were not the only Penates; for each family had generally but one Lar, whereas the Penates are usually spoken of in the plural. Their worship was closely connected with that of Vesta.

Pencil, an instrument used for painting, drawing, and writing. The first pencils used by artists were probably pieces of coloured earth or chalk cut into a form convenient for holding in the hand. On the introduction of moist colours, however, delicate brushes of fine hairs were used. Pencils of this kind, and of various degrees of fineness, are now almost solely used by painters for laying on their colours; but in China and Japan they are generally employed, instead of pens, for writing. The hairs used for these pencils are obtained from the camel, badger, squirrel, sable, goat, &c. The hairs, being selected, are bound in a little roll by a string tied tightly round their root ends. The roll is then fixed into the end of a quill tube. For larger pencils a socket of tin-plate is used instead of the quill. Black-lead pencils, for writing or drawing, are made of slips of graphite or plumbago (otherwise known as black-lead), generally cased in cedar wood. The finest qualities of graphite used to be obtained only from the Borrowdale mines in Cumberland. Blocks of graphite, however, are now rarely found of such size and purity that they can be sawn up into the small square slices of ordinary pencil length; but a method has been devised of purifying the inferior varieties, which are ground to a fine powder, levigated or washed until pure, intimately mixed with clay in various proportions, and afterwards solidified by pressure. The comparative hardness and blackness of pencils are attained by the degree of heat to which they are subjected and the proportions of graphite and clay in the leads. Nürnberg is the great centre of the lead-pencil trade. Coloured pencils are prepared from various chalks, such as are used for crayons, instead of from graphite. Pencils for writing on slate are made by cutting slate into small square pieces and rounding them, or into narrow slips and encasing them in wood.

Pendant, in architecture, a hanging ornament used in the vaults and timber roofs of Gothic buildings, more particularly in late Gothic work. In vaulted roofs pendants are of stone, and generally richly carved; in timber roofs they are of wood variously decorated. Fine examples of stone pendants are to be seen in the chapel of Henry VII at Westminster Abbey.

Penden'tive, in architecture, the portion of a dome-shaped vault which descends into a corner of a quadrangular opening when a ceiling of this kind is placed over a straight-sided area; in Gothic architecture, the portion of a groined ceiling springing from one pillar or impost, and bounded by the ridges or apices of the longitudinal and transverse vaults.



a, a, a, a, Pendentives, Beverley Minster Roof

Pendulum, in the widest sense, a heavy body suspended so that it is free to turn or swing upon an axis which does not pass through its centre of gravity. Its only position of stable equilibrium is one in which its centre of gravity is in the same vertical plane with the axis. If the body is displaced from this position, it will tend to return to it, and it will oscillate or swing from one side of that position to the other until its energy is destroyed by friction, and it at length comes to rest. A small, heavy body suspended from a fixed point by a string, and caused to vibrate without much friction, is called a 'simple pendulum'. When the swings of a simple pendulum are not too great—that is, when they are never more than about 3° on each side of the position of rest—the pendulum is isochronous, that is, each swing occupies the same time, and its period is given by the equation

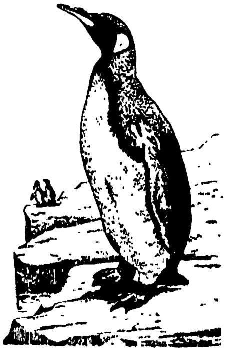
$$T = 2\pi\sqrt{l \div g};$$

where T is the period of a complete vibration, π is the well-known mathematical number 3·1416, l the length of the pendulum in feet, and g the acceleration due to gravity, or 32·19 feet per second per second at London. The 'seconds' pendulum has for its time of vibration (half its complete period) one second. In the above equation, putting for T two seconds, and for g 32·19, we find the length of the seconds pendulum at London to be 3·26 feet, or 39·1 inches. A true simple pendulum is a mathematical abstraction: a heavy particle, an inextensible and inflexible weightless string, and no friction; these conditions are only approximated to in nature. The ordinary pendulum is what is properly a 'compound pendulum'. A compound pendulum, as seen in clocks, is usually a rigid, heavy, pendulous body, varying in size according to the size of the clock, but the 'seconds' pendulum may be considered the standard. The pendulum is connected with the clockwork by means of the escapement, and is what renders the going of the clock uniform. (See *Clock.*) In a clock it is necessary that the period of vibration of the pendulum should be constant. As all substances expand and contract with heat and cold, the dimensions of a swinging body, and consequently its period of vibration, are subject to continual change. But *compensation pendulums* can be constructed, the period of which is independent of temperature. These are given particular names, according to their forms and materials, as the *gridiron pendulum*, the *mercurial pendulum*, &c. The former is composed of a number of rods so connected that the expansion or contraction of certain of them is counteracted by that of the others. The *mercurial pendulum* consists of one rod with a vessel containing mercury at the lower end, so adjusted in quantity that whatever alterations take place in the length of the pendulum, the centre of oscillation remains the same, the mercury ascending when the rod descends, and vice versa. For the use of the pendulum in determinations of the value of the acceleration g, see *Gravity*.

Penel'opê, in Greek legend, the wife of Odysseus (Ulysses) and mother of Telemachus. During the protracted absence of Odysseus, Penelopê was surrounded by a host of suitors, whom she put off on the pretext that before she could make up her mind she must first finish a winding-sheet which she was weaving for her father-in-law Laërtes. To gain time she undid by night the work she had done by day. Odysseus returned in time to protect his spouse and slay the obnoxious wooers who had been living in riot and wasting his property.

Peneplain, a term meaning 'almost a plane', invented by the geographer W. M. Davis for the nearly even surface produced across a country of uniform or very mixed types of rock by prolonged processes of subaerial denudation. Peneplains may be uplifted after being worked down to the base-level of the district, and may be warped in the process; but they will long preserve their characters, while they are being slowly eroded and dissected into less regular and often mountainous forms. An alternative spelling of the word is peneplane.

Penguin, the name given to swimming birds adapted for living almost entirely in the water, and constituting a distinct order (Sphenisciformes) including a single family (Spheniscidæ). They possess only rudimentary wings, destitute of quill-feathers, and covered with a scaly integument or skin. Although useless as organs of flight, the wings are very effective aids in diving, and on land they may be used after the fashion of fore-limbs. The legs are placed at the hinder extremity of the body, and the birds assume an erect attitude when on land. The toes are completely webbed. They inhabit chiefly the high southern latitudes, congregating sometimes in colonies of from 30,000 to 40,000. There are three different types of penguins, represented by the king penguin, the jackass penguin, and the rockhopper, constituting respectively the generic groups Aptenody̆tes, Spheniscus, and Eudyptes. The jackass penguin and the rockhopper are about 2 feet 3 inches in height, and the king penguin somewhat larger, while the emperor penguin (*Aptenody̆tes forsteri*) attains 3 feet; but a fossil penguin of the Upper Eocene stood from 6 to 7 feet high.



Penguin

Penicillium, a genus of Ascomycetous Fungi, group Plectascineæ. *P. crustaceum* is the common blue mould, a saprophyte of universal occurrence on stale bread, jam, damp leather, and paper, in fact on any moist substance containing even a trace of nutrient material.

Penicu'ik, a police burgh of Midlothian, Scotland, on the North Esk; served by the North British Railway. It has paper-mills, and coal-, shale-, and ironstone-mines. Objects of interest include the tower of the ancient church of St. Kentigern. Pop. (1921), 2673.

Penin'sula (Lat. *pene*, almost, and *insula*, an island), a portion of land almost surrounded by water, and connected with the mainland by a narrow neck or isthmus, e.g. the Iberian Peninsula (Spain and Portugal), the Scandinavian Peninsula (Norway and Sweden), Corea, Italy, and Malaya.

Peninsular War. The war in the Spanish Peninsula (1808–14) was a direct result of the 'Continental System' by which Napoleon I forbade commercial intercourse with Great Britain, for it was the hesitation of Portugal to obey the Berlin and Milan Decrees that led the French to invade the country and depose the House of Braganza. Immediately afterwards Napoleon forced his ally, Charles IV of Spain, to give up his crown, and placed his own brother Joseph on the throne. Insurrections against French military occupation broke out both in Portugal and in Spain, and in the summer of 1808 the British Government sent Sir Arthur Wellesley with 10,000 men to aid the Portuguese and co-operate with the Spanish Nationalists. He landed at Oporto, and, on his way to relieve Lisbon, won at Vimiero (21st Aug.) the first land-battle won by the British on European soil since the outbreak of war in 1793. Unfortunately, two senior officers arrived on the day of the battle, and they prevented Wellesley from pursuing his advantage, and made the Convention of Cintra, by which the French army was allowed to evacuate Portugal. All three generals were recalled, and Sir John Moore took command. He marched into Spain, but the defeat of the Spaniards by Napoleon forced him to retreat upon Corunna, in the north of Spain, where he had arranged for British transports to receive his troops. In the battle which he was compelled to fight before the embarkation, Moore was killed (16th Jan., 1809), but Marshal Soult was defeated, and Moore had saved the south of Spain and given the Spaniards a chance of recovery. Wellesley was sent back in April, 1809, and in July he won, on Spanish soil, the victory of Talavera, for which he was raised to the peerage as Viscount Wellington. But in the autumn his position was threatened by the movement of French armies, and he had to retreat to the Portuguese border. Early in 1810 he crossed into Portugal and slowly retired towards Torres Vedras, where he had constructed great entrenched lines from the River Tagus to the sea. The British army spent the winter of 1810–1 at Torres Vedras, which the French vainly besieged. When they withdrew in the spring of 1811, Wellington attacked them and won some victories, but considerable time was spent in the long-continued sieges of two fortresses, Badajos and Ciudad Rodrigo. Both fell early in 1812, and in July of the same year Wellington gained a crushing victory at Salamanca and entered Madrid. He had now driven the French from Galicia and a large part of Castile, but a fresh concentration of French armies under Soult compelled him, by the end of the year, to abandon Madrid and retire again to the borders of Portugal. The French armies separated to find winter quarters, and Wellington designed the campaign of 1813 to prevent their concentrating again. He had himself received reinforcements, and by a sudden movement in the early summer he attacked a French army under Joseph Bonaparte, who was awaiting the arrival of troops from Aragon and Catalonia. The battle of Vittoria (21st June) was another crushing victory, and the 'King of Spain' fled into France, while the British besieged fortresses on the frontier. Soult attempted to raise the sieges and to retrieve the fortunes of the French arms in the Peninsula, but Wellington defeated him at the battle of the Pyrenees, and drove him across the frontier in the beginning of August. He then invaded France, and in November won another victory on the River Nivelle. In the spring of 1814 he completed his task by continuing his invasion of France, beating Soult at Orthes (27th Feb.), and gaining his last victory at Toulouse on 10th April, four days after the first abdication of Napoleon. For his services in the Peninsula Wellington was raised, by successive steps, from a viscounty to a dukedom, and was given the rank of field-marshal. The six years' campaign had an important influence upon the fortunes of Napoleon, though it was not until Waterloo that he personally met Wellington in the field. He himself described the campaigns in the Peninsula as "a running sore", and the demands made by his commanders in Spain for man-power and supplies constituted a constant and severe drain upon the resources at his disposal. At the end of his struggle with the Central Powers of Europe, Napoleon found himself dependent upon an army of raw recruits because large forces of experienced troops had been wasted in the Peninsular fighting. The steadfastness of the British Government and the combination of patient waiting with swift action which marked Wellington's conduct of operations had their reward in sapping the strength of Napoleon's military empire.—BIBLIOGRAPHY: Sir W. Napier, *History of the War in the Peninsula and South of France*; Sir C. W. C. Oman, *History of the Peninsular War*; *Wellington's Army*.

Pen'istone, a market town of Yorkshire (West Riding), England, on the Don; served by the Great Central and the Lancashire & Yorkshire Railways. The Grammar School was founded in 1392. The town gives name to a parliamentary division, returning one member to Parliament. Pop. (1921), 3791.

Penitential Psalms, the seven psalms vi, xxxii, xxxviii, li, cii, cxxx, cxliii of the Authorized Version, so termed as being specially expressive of contrition. Reference is made to them by Origen. They have a special place in the breviary of the Roman Church. The psalm most frequently repeated as being the most penitential is the *Miserere*, Psalm li of the Authorized Version.

Penitentiary, at the court of Rome, an office in which the secret bulls, graces, or dispensations relating to cases of conscience, confession, &c., are examined and dispatched; also an officer in some Roman Catholic cathedrals, vested with power from the bishop to absolve in cases referred to him. The Pope has a grand penitentiary, who is a cardinal and is chief of the other penitentiaries. The word is also used to denote a form of prison in the United States.

Penn, William, the founder of the state of Pennsylvania, was born in London in 1644, died at Ruscombe, Berks, 30th July, 1718. He was the only son of Admiral Sir William Penn. In his fifteenth year he was entered as a gentleman commoner at Christ Church, Oxford, where he imbibed Quaker views, and was expelled from the university. His father sent him on travels in France and Holland, and in 1666 committed to him the management of a considerable estate in Ireland. At Cork he was committed to prison for attending Quaker meetings, and although he was very soon liberated he had to leave Ireland. In 1668 Penn appeared as a preacher and an author, and on account of an essay, entitled *The Sandy Foundation Shaken*, he was imprisoned in the Tower, where he remained seven months. During this time he wrote his most celebrated works, *No Cross, no Crown*, and *Innocency with her Open Face*. In 1670 Sir William died, fully reconciled to his son, to whom he left his estates and all his property. Penn preached his message in England, Holland, and Germany, but as the persecutions of Dissenters continued to rage, he turned his thoughts towards the New World. From his father he had inherited a claim upon the Government of £16,000, and in settlement of his claim the Government in 1681 granted him large territories in North America, the present state of Pennsylvania, with right to found a colony or society with such laws and institutions as expressed his views and principles. The following year Penn went over to America and laid the foundations of his colony on a democratical basis, and with a greater degree of religious liberty than had at that time been allowed in the world. A great number of settlers, not only Quakers, but members of all denominations, Englishmen, Germans, Swedes, gathered together; the city of Philadelphia was laid out upon the banks of the Delaware, and the colony soon came into a most flourishing condition. He remained in the province about two years, adjusting its concerns, and establishing a friendly intercourse with his colonial neighbours. Soon after Penn returned to England King Charles died (1685); and the respect which James II bore to the late admiral, who had recommended his son to his favour, procured to him free access at court. He made use of this advantage to solicit the discharge of his persecuted brethren, 1500 of whom remained in prison at the decease of the late king; and his influence is thought to have hastened, if it did not occasion, the proclamation for a general pardon, and the repeal of religious tests and penalties. At the Revolution in 1688 Penn's intimacy with the abdicated monarch created suspicions, in consequence of which he was accused of treason, and withdrew from public notice till 1693. In 1699 he again sailed for Pennsylvania, intending to make it the place of his future residence; but he returned to England again in 1701.—Cf. Mrs. Colquhoun Grant, *Quaker and Courtier: the Life and Work of William Penn.*

Pennant, Thomas, English naturalist and antiquary, born at Downing, in Flintshire, in 1726, died in 1798. He studied at Oxford, and early devoted himself to natural history and archæology. His chief works are: *British Zoology* (1761–9), *Synopsis of Quadrupeds* (1771), *Genera of Birds* (1773), *Arctic Zoology* (3 vols., 1784–7), *Tours in Scotland* (3 vols., 1790), *Tour in Wales* (2 vols., 1778–81), and *Account of London* (1790).

Pennat'ula, a genus of Cœlenterate animals (popularly known by the name of 'sea-pens' or 'cocks-combs'), class Anthozoa, sub-class Alcyonaria. The sea-pens consist each of a compound organism, which may be described as consisting of a main stem or *cœnosarc*, with lateral pinnæ or branches. These branches are crowded on their upper margins with the little polyps or individual animals that make up the compound mass, and which are connected together through the fleshy medium or cœnosarc. The lower end of the stem is fleshy, destitute of polyps, and contains an internal coral-rod. By this fleshy root the sea-pens attach themselves loosely to the mud of the sea-bed. The British species (*P. phosphorĕa*), averaging about 3 or 4 inches in length, derives its scientific name from its property of emitting a phosphorescent light.

Pennisetum, a genus of tropical and subtropical grasses. *P. typhoideum* is the pearl-millet, a grass of some economic importance in India.

Pennsylvania, a state in the Middle Atlantic division of the United States. Three divisions of the Appalachians traverse the state from north-east to south-west; in the south-east it occupies a part of the coastal plain, and a small portion of the Erie Plain is also included in the north-western corner. The state is drained mainly by the Susquehanna (drainage area, 21,000 sq. miles), the Delaware (6440 sq. miles), and the combined Monongahela-Ohio-Alleghany system (14,000 sq. miles). Harrisburg (pop. 1920, 75,917) is the state capital, but Philadelphia (pop. 1,823,158) is the largest city; others are Pittsburg (588,193), Scranton (137,783), Reading (107,784), and Erie (75,917), but there are many cities of over 30,000 inhabitants. There are (1919) 12,872 miles of steam and 4870 miles of electric railway track, including the systems of the Pennsylvania, the Lehigh Valley, the Erie, Baltimore, & Ohio, the Delaware, Lackawanna, & Western, and the Buffalo, Rochester, & Pittsburg. There is an extensive canal system. The population includes Asiatics and negroes, but is mainly of English stock, although there are also large numbers of Germans, Austrians, Irish, and Italian. Of religions, Roman Catholicism predominates. Agriculture, market-gardening, horticulture, and forestry are widely practised, the products including wheat (1920, 26,774,760 bushels), oats (44,858,825 bushels), tobacco (60,541,000 lb.), maize, rye, buckwheat, potatoes, and hay. Pennsylvania is the leading United States producer of coal, both anthracite and bituminous; petroleum, natural gas, iron (magnetite and hematite) ores, and stone are also worked. In leather production the state also leads, as in iron-working around Pittsburg as a consequence of the contiguous coal-fields. Other important manufactures are in textiles, and include woollens, carpets, hosiery, and silk and cotton goods. Education is compulsory between the ages of eight and fourteen years; there are a State college, normal schools, a subsidized (Federal) Agricultural Experiment Station, and three nonsectarian and four sectarian (Lutheran, Roman Catholic, Presbyterian, and Baptist) universities. Area, 45,126 sq. miles (294 sq. miles being water). An additional 891 sq. miles of Lake Erie is nominally included within the state sovereignty. Pop. (1920), 8,720,017 (of which 8,432,726 were white). See *Penn, William.*

Pennsylvania was one of the original thirteen states. It was settled between 1650 and 1660 by the Society of Friends (Quakers), but before that time there had been Scandinavian and Flemish settlements on the Lower Delaware. There are 67 counties. Modern government consists of a Governor and a Legislature, comprising a Senate (50 members, elected for four years, 25 seeking biennial re-election) and a House of Representatives (207 members, elected for two years). Two Senators and 36 Representatives are sent to Congress.—BIBLIOGRAPHY: J. T. Faris, *Seeing Pennsylvania*; A. H. Wharton, *In Old Pennsylvania Towns*; L. S. Shimmel, *A Short History of Pennsylvania.*

Penny, a British coin (formerly of copper, since 1860 of bronze) and money of account, the twelfth part of a shilling. It was at first a silver coin weighing about $22\frac{1}{2}$ grains troy, or the two-hundred-and-fortieth part of a Saxon pound. Till the time of Edward I it was so deeply indented by a cross mark that it could be broken into halves (thence called halfpenny) or quarters (fourthings or farthings). Its weight was steadily decreased till at last, in the reign of Elizabeth, it was fixed at $7\frac{23}{31}$ grains, or the sixty-second part of an ounce of silver. Copper pennies were first coined in 1797, but copper halfpennies and farthings had been in use from 1672. The old Scots penny was only $\frac{1}{12}$*d.* sterling in value, the pound being equal to 20*d.* sterling.

Silver Penny of time of William the First

Pennyroyal, a species of mint (*Mentha Pulegium*) formerly in considerable repute as a medicine, but now almost totally neglected. See *Mint.*

Pennywort, a name given to several plants with round or peltate leaves, such as the *Cotylēdon umbilīcus*, also known as *navelwort*, and the *Hydrocoty̆le vulgāris*, or *marsh pennywort*, a small umbelliferous plant growing in marshy places.

Penob'scot, the largest river of Maine, United States. It rises near the Canadian border, and flows 350 miles south by west to Penobscot Bay. It is navigable for ships to Bangor, 60 miles, where the tide rises 17 feet.

Penology deals with the punishment and the prevention of crime. No organized society can exist if its members do not obey its laws, and every community has to face the problem of dealing with its law-breakers. The penalties attached to transgressions are said to be based either on the principle of (*a*) retribution—the exaction from the offender of something equivalent to the loss or damage he has caused by his offence; (*b*) deterrence—the reaction on others from a knowledge of the consequences his act has brought on the offender; (*c*) reformation—the conversion of the offender to a better sense of his duties as a citizen, and his education and training as a means to the proper discharge of these duties; or on some combination of these. The principle of retribution is now little supported. A life for a life is sometimes exacted, but it is mainly on the ground of deterrence. There is wide divergence of opinion as to the deterrent effect on others of capital punishment; the only certainty is that it is effective in the case of the person who suffers it.

In more primitive communities, and in Great Britain until comparatively recent times, the penalties of crime were mainly physical. It was only in the nineteenth century that the death penalty was abolished for many crimes that are now visited with short periods of imprisonment, or even with an admonition. Our forefathers had not the same estimate as we have of the value of life. They may not have considered their own lives of less importance, but they had less regard for the lives of those who committed crime. If the crime were a serious one, the culprit was hanged; if it were less serious, he might be whipped. In certain cases he was banished, on pain of death if he returned. There was no pretence at reform. It was presumed that he could behave if he chose to do so, and if he broke the law he had to take the consequence. It would be rash to assume that the laws then were any more unsuited to existing conditions than ours are. They were harsh, but they were not always harshly applied save to the stranger; for generally we tolerate more from those we know than from those we do not know. The death penalty is now seldom exacted save for murder, and many homicides escape it. Flogging can only be inflicted in England and Ireland for certain serious crimes, and in Scotland it is abolished save in the convict prison. Fine or imprisonment has taken the place of these penalties in most cases; and public opinion seems to be moving in the direction of their abolition, not because the arguments in favour of that course are altogether convincing, but because of the growth of a sentiment against the employment of methods that seem brutal. Any reasonable objection to physical penalties applies in degree to imprisonment, and the justification for employing one or another must be founded on evidence that, in the public interest, nothing better can be done. Banishment from the realm, or from a part of it, for crime, has ceased. In the nineteenth century many were transported to the antipodes and put to work there, but the horrors to which they were subjected, and the objection of the colonies to receive them, caused the practice to be stopped. Penal servitude is now undergone in British prisons, though the convict is still liable to serve his sentence in any part of the king's dominions. The deterrent effect of any penalty depends mainly on the certainty that it will be inflicted.

Outside influences have always been in operation to interfere with the application of laws. The character of the person injured may prevent the culprit from getting his due, and the character of the offender and his connections may deflect the sword of justice. There is nothing like absolute certainty as to what will happen to the criminal who is caught; and the 'sporting chance' tends in many cases to neutralize the deterrent effect of punishment. It is far from uncommon for men to believe that though others have failed in an undertaking they will succeed; and this frame of mind is not peculiar to good citizens. The objection to all punishments is that the result cannot be estimated. Whether a man is flogged, or imprisoned for a determinate period, if he is set free he may revert to the course of conduct that brought punishment on him. He has paid the penalty of his crime. He has done an injury and submitted to one, and the account is square. That is not only his view, but it is the view that the law takes. If he does well, so much the better; and if he does ill, the process can be repeated. This must be poor consolation to the people he may injure and the taxpayers who have to support him; but the punishment of crime and the prevention of crime are not merely different, but opposite things. The factors that make for the committing of crime are many and varied, and some of them are social conditions that tend to produce other ills in the community; but in any individual case the causes of criminality might be sought with some hope of success if cure rather than punishment were the primary object. It is by no means certain that all who commit crime wish to do otherwise, but it is probable that if they knew they were to be prevented from following their inclinations, and were only allowed a conditional liberty until they had learned the need for behaving as good citizens, they would curb their vicious propensities. Wholesale schemes of reform have been projected and tried and changed; but the product of reformatories is disappointing, and the association of social defectives with one another is not to their advantage nor to that of the community. It is becoming recognized that making the punishment fit the crime only results in evil. The personality of the criminal has to be taken into consideration even though all that is sought is his punishment, for it cannot be assumed that if the criminal is punished the community is made safe. The mental condition of the criminal is always in question. We have long ceased to send lunatics to prison, and now the mentally defective are excluded also; but mental defect only accounts for the conduct of a small number of criminals, and in their cases if it furnishes a reason for keeping them out of prison, it equally makes it necessary to place them under restraint. It is unsafe to form an opinion on a person's character from consideration of any isolated act on his part; and the fact that a man has broken the law does not in itself enable anyone to say how he can best be treated in the interests of the community. In consequence of his offence his liberty is forfeited; but it is only possible to prescribe rationally for his treatment in detail on a knowledge of his history and of his qualities much more extensive than, and different in character from, that placed before the courts—which are only concerned with the question of his guilt or innocence of the charge before them. If he is found guilty, he is sentenced to the penalty the law prescribes for the crime he has committed; and that penalty takes small account of the peculiarities of the person to whom it is applied. It is nobody's business to seek to find the causes of his conduct; though it seems reasonable to suppose that unless he is brought to see that it is not worth his while to persist in law-breaking, there is little hope of his doing well. The penalties prescribed by the law may have a good effect on some; but the fact that so many repeat their offence shows that in their cases the desired result has not been obtained. It has been argued that the penalties themselves are accountable for the continuance in crime of those who suffer them; but there is no more reason to blame them for causing criminals to continue in crime than to credit them with the changed conduct of those who cease from it. Men are so unlike, and the motives that appeal to one are so different from those that influence another, that all systems for dealing with criminals in the mass are sure to fail with many, as they always have done; and opinion is steadily advancing in favour of the individual treatment of the offender. His liberty being forfeited, what is to be done with him? The answer must depend on who and what he is. The safety of the community must be the first consideration, and security must be taken against injury at his hands. He must be taught that his restoration to liberty will depend on his own conduct. All efforts at improving his efficiency as a worker and cultivating his intellect, if not based on this, are likely to result in making him a greater nuisance. He should not be turned loose on society to do what he likes; but he should be caused to undergo a period of probation under guardianship and supervision, during which his will and his power to conform to the law would be demonstrated in conditions that would continue after he had full liberty. His sentence would be determined as its conditions would be modified, not by the lapse of any period of time fixed beforehand, but by his own continued good conduct.

Penrhyn, or **Tongareva**, a coral atoll of Oceania, a dependency of the Dominion of New Zealand, 720 miles north of Rarotonga (Cook Islands). The enclosed lagoon has a large area, and is rich in pearl-shell, which provides a large pearling industry. Penrhyn was discovered in 1788, and annexed to New Zealand in June, 1901. The pop. (1916) is 326.

Penrith, an urban district and town of Cumberland, England, on the Eamont; served by the North-Eastern, London & North-Western, and the Cockermouth, Keswick, & Penrith Railways. There are a fourteenth-century grammar school and the ruins of a castle. It is an ancient town of Keltic foundation, and had a fair and market granted by Henry III (1222). The parish church of St. Andrew was founded before 1223, from which date the list of vicars is complete. Pop. (1921), 6403.

Penryn, a municipal borough and port of Cornwall, England, at the head of the estuary of the Penryn River; served by a branch of the Great Western Railway. Chemicals, bone-manure, paper, liquors, and leather are manufactured, and granite from local quarries is dressed. It is of ancient foundation, and stood within the domains of the Bishops of Exeter, which are mentioned in *Domesday Book*. Pop. (1921), 3151.

Pensacola, a city and port of entry of Florida, United States, the county seat of Escambia county, on Pensacola Bay; served by the Louisville & Nashville, and the Pensacola, Alabama, & Tennessee Railways, and by ocean-going steamships to European and American ports. The extensive land-locked harbour is defended by three forts, which also protect the United States navy-yard. Coal, timber, phosphates, naval stores, fish, cotton and cotton-seed oil, and feeding-stuffs make up the bulk of the transit trade, and Pensacola is generally a great depot of naval stores. Manufactures include wooden articles, manures, and drugs. The site was settled by the Spanish in 1696, and the settlement was captured twice in 1719 by the Sieur de Bienville, French Governor of Louisiana, who razed it to the ground. In 1763 the Floridas were ceded to Great Britain, and in 1821 passed finally to the United States. Pensacola became a city in 1895. Pop. (1921), 31,035.

Pensions (Lat. *pensio*, payment), annual grants of money, usually in consideration of services rendered. In Britain, besides Old Age Pensions (q.v.) and pensions paid to judges, civil servants, employees of local authorities, teachers, and others on retirement and properly known as superannuation allowances, there are pensions payable to certain retired ministers of the Crown who have served a specified number of years in office, to persons distinguished in art, science, and literature, or their dependents (Civil List pensions), and to the Crown forces.

Until 1916 the administration of pensions to the forces was controlled by the Admiralty, the War Office, the Chelsea Commissioners, and the Royal Patriotic Fund; and it was not until that year that there was any system of unified control. In that year the Ministry of Pensions was formed to take over the entire administration of wound and disability pensions, service pensions continuing in the hands of the Admiralty and War Office. Improvements were effected. Thus disabilities were classified and facial disfigurement made pensionable; the alternative pension was introduced; earning capacity was excluded from consideration in standard pension claims; and pensioners' widows were given the right to one-half of their late husbands' pensions during widowhood. Every man suffering from a disability due to or aggravated by service in the European War, and not attributable to his fault or neglect, is entitled to a pension. The standard pensions for army privates, seamen, marines, or airmen are as follow:

	Pension.	Weekly.
1. Loss of two or more limbs; arm and eye; leg and eye; both hands; both feet; hand and foot; or both eyes. Complete disablement. Incurable disease; &c.	100 %	40*s*.
2. Loss of right arm from shoulder ..	90 %	36*s*.
3. Loss of leg, right arm below shoulder; left arm from shoulder; severe facial disfigurement; loss of speech ..	80 %	32*s*.
4. Less severe specified amputations; total deafness	70 %	28*s*.
5. Still less severe specified amputations	60 %	24*s*.
6. Leg amputated below knee; left arm below elbow; loss of eye	50 %	20*s*.
7. Loss of thumb; four fingers of right hand; &c.	40 %	16*s*.
8. Similar injuries to left hand; &c. ..	30 %	12*s*.
9. Loss of two fingers of either hand; &c.	20 %	8*s*.

This table is subject to revision in 1923 according to the cost of living, but not so as to reduce the full pension below 33*s*. For cases above the rank of private there is a similar scale, the full pension for a warrant-officer, Class I, being 60*s*. per week.

A wife allowance not exceeding 10*s*. per week, and graduated according to the scale of the man's own pension, is given to a married warrant-officer, non-commissioned officer, or man, unless the marriage took place after discharge, after the war, or after the disablement. If the spouses are separated, the allowance may be paid to the wife. The maximum children allowances (which are also graduated) are 10*s*. and 7*s*. 6*d*. per week for the first two children and 6*s*. for each other child when no wife allowance is paid, and 7*s*. 6*d*. for the first and 6*s*. for each other child when there is a wife allowance. A childless widow under forty years of age receives 20*s*. to 30*s*., and a widow over forty or with pensioned children

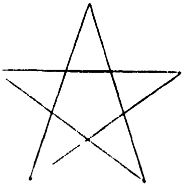
26*s*. 8*d*. to 40*s*. per week, according to the husband's rank. The children are pensioned on the highest children scale.

Parents and other dependents of deceased fighting men are pensioned if (*a*) wholly dependent on the deceased, or (*b*) indigent and without means of support (maximum pension, 20*s*. weekly). If the deceased was unmarried and under twenty-six years of age when joining up, and if no other pension is payable, 5*s*. per week may be granted to the parents.

The alternative pension is a substitute for the standard pension and wives' and childrens' allowances. It is the difference between pre-war and present earning capacity (60 per cent being added to pre-war earnings), but pension and earnings together must not exceed £5 per week.

In 1921–2 there were 3,241,300 pensioners, of whom disabled officers and men numbered almost 1,500,000.

Pen'tacle, a figure consisting of five straight lines crossing and joined so as to form a five-pointed star. It was a symbol among the Gnostics, and was employed with superstitious import by the astrologers and mystics of the Middle Ages.



Pentacle

Pentac'rinus, a genus of graceful encrinites or stone-lilies, most of the species of which are extinct. Fossil pentacrinites abound in all strata from the Lias onwards, while some species still exist in the deep sea, with others belonging to the closely allied genus Metacrinus.

Pentam'era, one of the primary sections into which beetles are divided, including those which have five joints on the tarsus of each leg.

Pentam'eter (Gr. *pente*, five, and *metron*, measure), in prosody, a verse consisting of five feet. The verse consists of two parts, called penthemimers, which are kept distinct. The first penthemimer contains two feet (dactyls or spondees) and a long syllable. The second contains also two feet (both dactyls) and a long syllable. The pentameter, when wedded to its heroic consort the hexameter, forms the elegiac couplet. It never is used alone. There were many writers of elegiacs among the ancient Greeks, but the couplet enjoyed an even greater vogue among the Romans. Catullus, Tibullus, and Propertius all wrote elegiacs, and Ovid brought this form of composition to an almost monotonous perfection.

Pen'tateuch is a collective term for the first five books in the Old Testament. It is derived from a Greek adjective which means five-volumed (*penta* = five, *teuchos* = volume); 'the five-volumed book' was the title of *Genesis*, *Exodus*, *Leviticus*, *Numbers*, *Deuteronomy*. It was simply a literary term. The Jews used 'Torah' ('instruction', 'injunction') as their religious description, for which the word 'Law' is not an exact equivalent. 'Law' calls up associations in a modern mind which 'Torah' did not for a Jew; besides, these five books contain much more than legal injunctions or codes for the regulation of social and civil life. Still, it was these five books which contained the commands, promises, and revelations of God by means of which the community of Israel had been formed and organized; and while 'Torah' might be applied to the whole of the Old Testament or employed in a general sense, it came to be attached specifically to what was known later as the *Pentateuch*, i.e. to the first of the three divisions of the Old Testament, the other two being 'The Prophets' (i.e. the books of *Joshua*, *Judges*, *Samuel*, and *Kings*, with the three major and the twelve minor prophets) and 'The Writings' (including *Daniel* and the rest of the Old Testament).

The *Pentateuch* is not a legal code, but a continuous history which runs from the creation of the world to the settlement of Israel in Canaan. The five volumes of which it is composed were not canonized until after the exile, in the fifth century B.C., and they did not assume their final form until the third century B.C., when they were translated into Greek. But they contain some early material, which can be disentangled from the subsequent traditions and legal collections. The books of the *Pentateuch* are books made out of books; at least three or four documents can be detected running through them, and, indeed, through the book of *Joshua* as well. The age, origin, and relations of these documents form the problem of the literary study of the *Pentateuch*, or, as scholars now prefer to say, the *Hexateuch* (the six volumes, i.e. including *Jcshua*).

It is possible that some of the early traditions may go back to Moses, but the final editing of the books did not take place until long after the death of Moses, and none of the independent narratives which underlie the *Pentateuch* can be connected with him as author. It was the veneration of later Jews for Moses, and the belief that the beginnings of their community-life were connected with his legislation, that led to the conviction that he had written the five books in which the origins of the nation were described, the theory being "that every Jewish leader of Israel wrote down by divine authority the events of his own time, so that the sacred history is like a daybook constantly written up to date. No part of the Bible corresponds to this description, and the *Pentateuch* as little as any" (W. Robertson Smith). Even the authors of the sources lived later than Moses, and the water-marks of the five books show that they presuppose the period of the kings and a prolonged residence in Canaan. But in these old uncritical days it was not difficult to believe that because the law of Moses (i.e. the legislation enacted by Moses) had been vital to Israel, therefore he must have written all the books in which that law was enshrined. Hence the five books came to be known as ' the Law of Moses '. Authority carried with it authorship, according to this view. For the history of Judaism the belief was of enormous importance; it explains the tenacity and self-confidence of the religion; it helped to consolidate the nation, although it now turns out to be unfounded.—BIBLIOGRAPHY: W. Robertson Smith, *The Old Testament in the Jewish Church* (1881, 1892); D. C. Simpson, *Pentateuchal Criticism* (1914); A. T. Chapman, *Introduction to the Pentateuch* (1911), with the section in S. R. Driver's *Introduction to the Literature of the Old Testament.*

Pen'tecost (Gr. *pentēkostē*, the fiftieth), a Jewish festival, held on the fiftieth day after the Passover, in celebration of the ingathering and in thanksgiving for the harvest. It was also called the *Feast of Weeks*, because it was celebrated seven weeks after the Passover. Tradition connects this festival with the giving of the law on Sinai, and considers it as the birthday of Judaism. It is also a festival of the Christian Church, occurring fifty days after Easter, in commemoration of the descent of the Holy Ghost on the disciples, called in England *Whitsuntide.*

Pentland Firth, a channel separating the mainland of Scotland from the Orkney Islands, and connecting the North Sea with the Atlantic Ocean. It is about 17 miles long east to west, and 6 to 8 miles broad. A current, setting from east to west, flows through it with a velocity of 8 to 9 miles an hour, causing many eddies and rendering its navigation difficult and dangerous. The Pentland Skerries include two islets and several rocks.

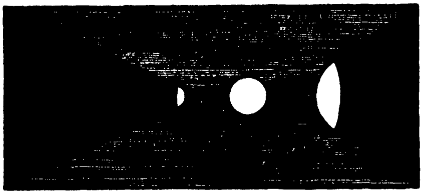
Pentland Hills, a range of Scotland, in the counties of Edinburgh, Peebles, and Lanark, commencing 4½ miles south by west of Edinburgh, and extending south-west for about 16 miles. The highest summit, Scald Law, is 1898 feet above sea-level. The water-supply of Edinburgh comes from springs in the Pentlands.

Pentlandite, a mineral iron nickel sulphide, with a platy cleavage and a brass-yellow colour. It is diffused through the famous pyrrhotine mass of Sudbury, in Ontario, and is the great source of nickel in that ore-body.

Pentonville, a district of London, in the borough of Islington. The name is familiar through the Pentonville convict prison, erected in Caledonian Road, Islington, by Sir J. Jebb (1842). Pentonville was the birth-place of John Stuart Mill.

Pentste'mon, a genus of herbaceous plants, of the nat. ord. Scrophulariaceæ, with tubular flowers having four perfect stamens and one rudimentary. They are natives of America, and are distinguished by their showy flowers of various colours—red, purple, blue, white, &c. They are cultivated in gardens, though as a rule they are unable to stand a British winter.

Penum'bra, the partial shadow between the full light and the total shadow caused by an opaque body intercepting the light from a luminous body, the penumbra being the result of rays emitted by part of the luminous body.



Umbra and Penumbra

An eye placed in the penumbra would see part of the luminous body, part being eclipsed by the opaque body; an eye placed in the umbra, or place of total shadow, would receive no rays from the luminous body. Thus in an eclipse of the sun, an observer situated in the penumbra sees a partial eclipse; one in the umbra, a total eclipse. The latter phenomenon, of course, can be seen only if the moon's umbra reaches the earth. The cut shows the phenomena of the umbra and penumbra in the case of a luminous body between two opaque bodies, the one larger, the other smaller than itself. Since the earth and moon, and indeed all the other bodies of the solar system, are much smaller than the sun, in all their cases the umbra is a cone tapering to a point, as shown on the left-hand side of the cut. See *Eclipse.*

Penza, a government of Central Russia, bounded by Nijni-Novgorod, Tambov, Saratov, and Simbirsk; area, 14,996 sq. miles; pop. 1,940,000. The forests are extensive. The chief exports are corn, spirits, timber, metals, and oils.

Penza, the capital of the government of same name, stands at the junction of the Penza and Sura, on the Morshansk-Syzran Railway. It was founded in 1666 as a defence against Tartar incursions; has a cathedral, and several other churches. Pop. 88,000.

Penzance', a municipal borough and seaport of Cornwall, England, on Mount's Bay; a terminal station of the Great Western Railway, and the most westerly town of England. The climate is so mild that Penzance has found favour as a health-resort. The harbour, formed by two piers, is commodious, and has dry-docking accommodation. It is a centre for the pilchard and mackerel fisheries, the former fish being largely exported to Italy. Tin is also shipped, and early vegetables are sent to London. There are no buildings of antiquarian interest. As a fishing-village Penzance existed from the fourteenth century, and was the property of the manor of Alverton. The Spanish devastated Penzance in 1595, and as a consequence the rebuilt town was incorporated in 1614. It was made a stannary town in 1663 (Charles II). Pop. (1921), 12,096.

Pe′ony (Pæonia), a genus of plants belonging to the nat. ord. Ranunculaceæ, and very generally cultivated in gardens for the sake of their large showy flowers. The species are mostly herbaceous, having perennial tuberous roots and large deeply lobed leaves. The flowers are solitary, and of a variety of colours, crimson, purplish, pink, yellow, and white. The flowers, however, have no smell, or not an agreeable one, except in the case of a shrubby species, *P. Moutan*, a native of China, of which several varieties, with beautiful whitish flowers stained with pink, are cultivated in gardens. The roots and seeds of all the species are emetic and cathartic in moderate doses. *P. officinālis* or *festīva*, the common peony of cottage gardens, was formerly in great repute as a medicine.

People's Palace, a building at 309 Mile End Road, East End of London, opened by Queen Victoria in May, 1887. The nucleus of the palace was the Beaumont Institute, founded by J. T. B. Beaumont (died 1840), who left £12,500 to establish an institution for the moral and intellectual improvement of the working-classes in the East End of London. A movement set on foot by a novel by Sir Walter Besant—*All Sorts and Conditions of Men* (1882)—resulted in raising the fund to £75,000. The foundation includes a technical school (East London College), affiliated to London University and the Queen's Hall, for exhibitions and amusements.

Peo′ria, a city and port of entry of Illinois, United States, the county seat of Peoria county, on Lake Peoria (Illinois River); served by the Chicago, Rock Island, & Pacific, the Chicago & Alton, Illinois Central, and ten other railways. There is a Roman Catholic cathedral (St. Mary's). From Peoria the Illinois River is navigable to its mouth (St. Louis), and the steamer traffic in grain, &c., ex Peoria is enormous. The Michigan Canal runs to Chicago. Manufactures include automobiles, agricultural machinery, canned-meats, and glucose. Peoria originated in a village established on the present site in 1778. It became a town in 1835, and a city in 1845. Pop. (1920), 76,121.

Peperi′no, the Italian name for a volcanic tuff composed of sand, scoriæ, &c., cemented together. It is so named from the small peppercorn-like fragments of which it is composed. The Tarpeian Rock in Rome is composed of red peperino, and the catacombs are the hollows of old quarries dug in it.

Peperomia, a large tropical genus of Piperaceæ, mostly small herbs, many epiphytic, with fleshy leaves. Some are grown in hot-houses for their ornamental foliage.

Pepin, the name of three Frankish rulers under the last kings of the Merovingian dynasty. Pepin I, or Pepin of Landen (died A.D. 639), was major-domo of King Dagobert I. His son, Pepin II, or Pepin of Heristal, major-domo at the court of Dagobert II, was, after the death of the king, appointed Duke of the Franks, and under a feeble regency ruled the kingdom with almost despotic sway. Charles Martel was his natural son. Pepin le Bref, son of Charles Martel, and grandson of Pepin of Heristal, was, by agreement with the Pope, proclaimed King of the Franks in 752, after the deposition of Childeric III. He defeated the Langobardi in Italy, and made the Holy See a present of the lands which he conquered from them—the origin of the temporal power of the Popes. He became the founder of the Carlovingian dynasty, being succeeded at his death in 768 by his son, Charles the Great, usually called Charlemagne.

Pepper (*Piper nigrum*)

Pepper (Piper), a genus of plants, the type of the nat. ord. Piperaceæ. The *Piper nigrum*, which furnishes the black pepper of commerce, is a native of the East Indies, where it is cultivated on an extensive scale. It is a climbing plant with broad, ovate, acuminate leaves, and little globular berries, which, when ripe, are of a bright-red colour. The pepper of Malacca, Java, and especially of Sumatra, is the most esteemed. Its culture has been introduced into various other tropical countries. White pepper is the best and soundest of the berries, gathered when fully ripe, and deprived of their external skin. The betel (*P. Betle*), belongs to the same genus. Cayenne pepper, Guinea pepper, bird pepper, &c., are the produce of species of Capsicum, nat. ord. Solanaceæ. Jamaica pepper is pimento or allspice.

Pepperwort, a plant of the genus Lepidium, one species of which (*L. sativum*), the common garden cress, is cultivated for the table.

Pep'sin is a ferment found in the gastric juice, and which, along with hydrochloric acid, is the chief factor in the digestion of proteins in the stomach. It differs from nearly all other enzymes (ferments) in the body in that it requires an acid medium in order that it may act. Pepsin, prepared from the lining membrane of the stomach of the pig or sheep, is used medicinally in cases of impaired digestion.

Pepys, Samuel, English diarist and naval official, was born in 1633, and died in 1703. His father was a London tailor, so his unfailing interest in clothes, especially his own, was probably hereditary. He was educated at St. Paul's School and at Magdalene College, Cambridge. He became clerk of the king's ships and clerk of the Privy Seal in 1660, Surveyor-General of the Victualling Office in 1665, and Secretary of the Admiralty in 1684. He was deprived of his office at the Revolution, and lived in retirement until his death. As a naval official Pepys showed himself both brilliant and reliable. The Restoration was a time of great difficulty for the Admiralty officials, and it is not too much to say that Pepys did more than any of his contemporaries to make the navy efficient. Pepys lived a very full life and had many interests. He was devoted to music and the drama. He was elected an F.R.S. in 1665, and was president of the Royal Society from 1684 to 1686.

Pepys left his books, some 3000 in number, as well as manuscripts and papers, to Magdalene College, Cambridge. Among these books was his diary, written in the system of shorthand which had been expounded in Thomas Shelton's *Tachygraphy* (1641). The manuscript was in six quarto volumes, and extended to 3012 pages. It was not deciphered until 1819, when the Hon. George Neville, master of Magdalene, urged on by the success of Evelyn's *Diary* (published 1818), got John Smith, then an undergraduate of St. John's College, to decipher it. It was first published in 1825, under the editorship of Lord Braybrooke. It at once became famous. The *Diary* begins on 1st Jan., 1660, and ends on 31st May, 1669, when Pepys believed he was going blind. The author was therefore twenty-seven years of age when he began to write his *Diary*, and thirty-six when he ended it. It is a unique work. It is not merely that it gives a graphic picture of social life at the time of the Restoration, that it gives invaluable accounts of men in high places, and important information about the stage and indeed about countless interesting subjects. It is an unequalled piece of self-revelation. Lovers of Pepys may be said to know him better than they know themselves, because he has recorded not only those things which men do not tell to other men, but also those things which men do not acknowledge even to themselves. It is thus one of the most curious and interesting books in the world. An edition, much more complete than the 1825 one, appeared between 1875 and 1879, Mynors Bright being the editor. An even fuller edition by H. B. Wheatley, containing all of the *Diary* that is fit for publication, appeared between 1893 and 1899.—BIBLIOGRAPHY: E. H. Moorhouse, *Samuel Pepys: Administrator, Observer, Gossip*; H. B. Wheatley, *Samuel Pepys and the World he lived in*; R. L. Stevenson, *Familiar Studies of Men and Books*.

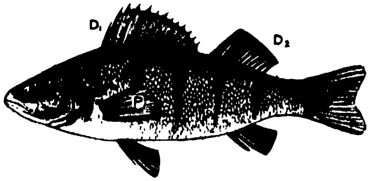
Perak, one of the Federated Malay States, British Malaya, with a long seaboard to the Straits of Malacca; traversed by two mountain chains and drained mainly by the Perak, the largest river. Tin, rubber, sugar, and coco-nuts are the staple exports, but rice (padi) is largely cultivated for export, the Krian irrigation works watering over 70,000 acres and forming also a reserve of drinking-water. The main irrigation canal is 21 miles in length, and has about 200 miles of distributory channels. The eastern trunk line of the Federation Railways traverses the state, with branches to Port Weld, Tronoh, and Telok Anson. Taiping is the chief town. Perak came under British influence in 1826, and in 1874 a British Resident was appointed (Treaty of Pangkor). On the murder of the Resident (1875) order was restored by British troops, and in July, 1896, the four Protected States (Perak, Pahang, Selangor, and Negri Sembilan) made a treaty with the British Government providing for an administrative federation under a Chief Secretary. Area, 7800 sq. miles; pop. (estimated), 500,000. See *Malaya*.

Perception, a term used in psychology and epistemology, and denoting a sensory experience involving meaning. It is the faculty or peculiar part of man's constitution by which he acquires knowledge through the medium or instrumentality of the bodily organs; the act of apprehending material objects or qualities through the senses. The perceptive faculty is exercised through the instrumentality of the senses; thus we see by means of the eye and hear by means of the ear. A person in whom these organs are wanting or defective will not perceive at all, or perceive imperfectly. The impression made on the organs of sense affects the nerves, and by them is conveyed to the brain. The necessity of this communication may be ascertained by experiment: if the nerve appropriated to any organ be cut or tied, there is no perception; and the same result is observed in certain disordered conditions of the brain, even though the organs of sense and the nerves duly perform their special functions. Although philosophers in all ages have endeavoured to explain the functions of the brain and nerves in connection with perception, all that can be affirmed with certainty respecting the means of perception is that when an impression is made on the physical organs and conveyed by the nerves to the brain, perception takes place. The impressions so communicated are the occasions of the mind perceiving, but we can assign no reason why it should do so invariably under such circumstances and not under any other, further than that such is the constitution of our nature.

Perception is to be distinguished both from *sensation*, which is the result of a *stimulation* of the senses, and does not imply recognition of the object, and also from *ideas*, which are experiences in the absence of the object. Whilst ideas consist only in memory elements, perceptions imply both memory experiences and sensory elements. Two great disputes are connected with perception, both brought into full prominence by Bishop Berkeley. The first is the origin of our judgments of the distances and real magnitudes of visible bodies. Berkeley maintained, in opposition to the common notions on this subject, that these were learned by experience and not by the mere act of vision. The second question has reference to the grounds we have for asserting the existence of an external material world, which, according to Berkeley, was connected with the other. Seeing that perception is a mental act, and knowledge is something contained in a mind, what reason have we for believing in the existence of objects apart from our minds? or what is the mode of existence of the so-called external world?—BIBLIOGRAPHY: G. T. Ladd, *Philosophy of Knowledge*; W. Hamilton, *Discussions on Philosophy*; R. Adamson, *The Development of Modern Philosophy*.

Per'ceval, Spencer, British statesman, son of John Perceval, Earl of Egmont, born 1762, died in 1812. Educated at Harrow and Trinity College, Cambridge, he practised at the Bar, and entered Parliament in 1796. In 1801 he became Solicitor-General, and in 1802 Attorney-General. In 1807 he was appointed Chancellor of the Exchequer, and on the death of the Duke of Portland, in 1809, he became Premier. In this post he continued till 11th May, 1812, when a madman named Bellingham shot him dead with a pistol in the lobby of the House of Commons. Perceval was a keen debater and a fluent and graceful speaker, but was shallow and intolerant, and unequal to the task of leading the councils of a great nation.

Perch, a genus of spiny-finned fishes, forming the type of the perch family (Percidæ). The common perch (*Perca fluviatilis*) is a common tenant of freshwater lakes and rivers. The body is broad, and somewhat flattened laterally. There are two dorsal fins, the anterior supported by very strong spines. It is coloured a greenish-brown on the upper parts, the belly being of a yellowish or golden white. The sides are marked with from five to seven blackish bands. The average weight is from 2 to 3 lb. The perch is a voracious feeder, devouring smaller fishes, worms, crustaceans, &c. A closely allied family (Serranidæ) includes the sea-perch or bass (*Labrax lupus*), which is plentiful on the southern coasts of Britain and in the Mediterranean; and also the numerous species of Serranus, which range through tropical and temperate seas. For the climbing-perch of India, see *Climbing-perch*.



Common Perch (*Perca fluviatilis*)

P, Pectoral fin. D₁ and D₂, Dorsal fins.

Perchlorates and Perchloric Acid. Perchloric acid, ($HClO_4$), is prepared by the action of concentrated sulphuric acid on potassium perchlorate. It is a colourless, syrupy liquid, which has strong oxidizing properties, and when brought in contact with organic matter is decomposed immediately. The acid is unstable, but it forms a series of stable salts which are soluble in water. The least soluble of the salts are the potassium salt, $KClO_4$, and the rubidium salt, $RbClO_4$; the former is used for estimating the potassium in soils. The salts are also oxidizing agents, and are sometimes employed in the preparation of certain explosives, e.g. *permonit*, a mixture of ammonium nitrate, potassium perchlorate, and T.N.T.

Percussion, in medicine, that method of diagnosis which consists in striking gently on the surface of one of the cavities of the body, and then endeavouring to ascertain from the sound produced the condition of the organ lying beneath. Percussion is most frequently used on the chest, but it is also occasionally applied to the cavity of the abdomen, the head, &c.

Percy, the name of a noble family who came to England with William the Conqueror, and whose head, William de Percy, obtained thirty knights' fees in the north of England. A descendant, also named William, who lived in the early part of the twelfth century, left behind him two daughters, the elder of whom died childless, and the younger, Agnes, married Josceline of Lorain, brother-in-law of Henry I, who assumed the surname of his bride. His son, Richard de Percy, was one of the twenty-five barons who extorted Magna Charta from King John. His great grandson, Henry, Lord Percy, was created Earl of Northumberland in 1387. He was Marshal of England at the coronation of Richard II, against whom, however, he took up arms, and succeeded in placing the crown on the head of the Lancastrian aspirant, Henry IV. He took up arms against this king also, but his forces were beaten at Shrewsbury (1403), where his son, Henry Percy (Hotspur), fell; and again at Barnham Moor (1407–8), where he himself fell. His titles were forfeited, but were revived in favour of his grandson Henry, who was appointed Lord High Constable of England, and who fell fighting in the Lancastrian cause at St. Albans (1453). For the same cause his son and successor shared the same fate at Towton (1461). The fourth earl was murdered during a popular rising, caused by his enforcing a subsidy ordered by the avaricious Henry VII. The sixth and seventh earls fell by the hands of the executioner in the reigns of Edward VI and Elizabeth respectively. The eighth died a violent death in the Tower, where he was confined on a charge of taking part in a plot in favour of Mary of Scotland. Algernon, the tenth earl, took part in the Civil War against Charles I, and afterwards used all his influence to bring about the Restoration. Josceline, the eleventh earl, died without male issue; his only daughter married Charles, Duke of Somerset, and became the mother of Algernon, Duke of Somerset, who was created Earl of Northumberland, with remainder to his son-in-law, Sir Hugh Smithson, a Yorkshire baronet of good family. The latter succeeded to the earldom in 1750, assuming the name of Percy, and in 1766 received the ducal title. The present duke (who succeeded in 1918) thus represents the female line of the ancient historical House.—Cf. G. Brenan, *History of the House of Percy*.

Percy, Thomas, Bishop of Dromore, was born at Bridgenorth in 1728, and died at Dromore in 1811. He graduated M.A. at Christ Church, Oxford, in 1753. He was then presented to the living of Easton Maudit, and in 1756 to Wilby, in Northamptonshire, and in 1766 he became domestic chaplain to the Duke of Northumberland. In 1769 he was appointed chaplain to the king, and in 1778 raised to the deanery of Carlisle, which he resigned four years after for the Irish bishopric of Dromore. The most popular of his works is his *Reliques of Ancient English Poetry*, based on an old manuscript collection of poetry, but much modernized in style. The work was published in 1765, and materially helped to give a more natural and vigorous tone to English literature, then deeply tainted with conventionalism.—Cf. A. C. C. Gaussen, *Percy: Prelate and Poet.*

Perekop′, ancient **Taphros**, a town of South Russia, on the Isthmus of Perekop, and in the government of Taurida, formerly a place of some military importance. Fighting took place at Perekop in 1919–20 between the Soviet troops and the counter-revolutionaries. Pop. 6000.

Perekop, the isthmus, about 20 miles long, by 4 miles wide where narrowest, connects the peninsula of the Crimea with the mainland, and separates the Sea of Azov from the Black Sea.

Père-la-Chaise (pār-lȧ-shāz), a cemetery of Paris, opened in 1804. It occupies ground a part of which was granted to Père de la Chaise, or Chaize, confessor of Louis XIV. See *Paris*.

Perennial, in botany, a term applied to those plants whose roots subsist for a number of years, whether they retain their leaves in winter or not. Those which retain their leaves are called *evergreens*, such as cast their leaves are called *deciduous*. Perennial herbaceous plants, like trees and shrubs, produce flowers and fruit year after year.

Perennibranchiata, a section of the amphibian order Urodela, in which the branchiæ or gills of early life persist throughout the entire existence of the animal, instead of disappearing when the lungs are developed. Examples are seen in the Proteus, Siren, and Axolotl. See *Amphibia*.

Pereyaslavl, an old town of Southern Russia, in the government of Poltava. It was founded in A.D. 993 by Vladimir of Muscovy, and was the seat of a principality from 1054. It fell to the Mongols in 1239. Pop. 18,000.

Pereyaslavl-Zalyesskii, an old town of Central Russia, in the government of Vladimir. It was founded in 1152 by the Prince of Suzdal, and was the seat of a principality from 1195 to 1302. Pop. 9000.

Perfectionists, or **Bible Communists**, popularly named **Free-lovers**, an American sect founded in 1838 by John Humphrey Noyes

(1811–86). Noyes was employed as a law-clerk at Putney, in Vermont, when the fierce religious revival of 1831 spread over the New England states, but he abandoned law for religion, and took upon himself the restoration of the primitive Christian ideal. His distinctive doctrines were: (1) reconciliation to God and salvation from sin—purely matters of faith; (2) recognition of the brotherhood and the equality of man and woman; and (3) community of labour and its fruits. In 1838 he succeeded in organizing a society giving expression to his views at Putney. The society practised community of goods and community of wives. A system of complex marriage was established, by which each man became the husband and brother of every woman, and every woman the wife and sister of every man. They rejected all laws and rules of conduct, except those which each believer formulated for himself, maintaining that true believers were free to follow the indications of the Holy Spirit in all things, nothing being good or bad in itself. To prevent the disastrous result naturally arising from the ignorant exercise of individual liberty, the Perfectionists introduced the 'principle of sympathy', or free public opinion. In 1847 about fifty members of the family bought a piece of forest-land at Oneida Creek, New York State, and there established a communistic society. At one time this society numbered over 300 members, with a branch community of 50 or 60 members at Wallingford, Connecticut. So things went on for thirty years; but the public opinion of the neighbourhood began to demand that the social practices of the society should be abandoned; and this was done in 1879 under the counsel of Noyes himself. Marriage and family life were introduced; and in 1880 communism of property gave way to joint-stock, and the society was legally incorporated as the Oneida Community, Limited. Some communistic features, however, were preserved, such as common dwellings, a common laundry, library, reading-room, &c.

Perfumes are obtained from both natural and artificial sources. Natural perfumes are preparations of the pleasant-smelling essential oils chiefly obtained from plants. Several are obtained from animals. Artificial perfumes are chemicals, many of which actually occur in essential oils. The chief distinction between essential and common oils, apart from their odour, lies in the much greater volatility of the former. If a drop of each is placed on paper, the grease-spot produced by the common oil will remain long after all trace of the other has disappeared. Further, common oils are not soluble in water; essential oils are slightly soluble, e.g. rose-water.

The extraction of the oils from plants forms a large industry, notably in France, Australia, and the United States, and it is effected by five different methods. In extraction by *distillation*, the method generally adopted, the part of the plant containing the perfume (petal, leaf, root, &c.) is, if necessary, cut into small pieces and placed in a still. Steam is blown in, and carries over with it the oil into the condenser. The oil is then run from the surface of the condensed water on which it floats. In the case of the valuable otto of rose, the condensed water, which contains small quantities of the perfume, is used again for generating steam.

The method of *maceration* is used when distillation would injure the delicacy of the perfume. Violets are macerated by hand in hot lard, in which the perfume is absorbed, and from which it is afterwards extracted by shaking with alcohol. Another method is by *direct extraction*, the usual solvent being light petroleum. After extraction, the solvent is removed by distillation, leaving behind the essential oil.

The method of *enfleurage* is used for plants, such as jasmine, which continue to form and emit the perfume after they have been gathered. The flowers are placed at the bottom of a vertical chamber, and a slow stream of moist air is passed upwards through the chamber, carrying the perfume, as long as it is emitted, over a number of glass shelves spread with lard. The oil is extracted from the lard with alcohol. Finally, *expression* is used in rare cases, e.g. orange, lemon, bergamot, where the oil can actually be squeezed from the rind of the fruit. The yield of oil is usually small and varies with the plant, e.g. 1 cwt. lavender flowers yields about 32 oz., and 1 cwt. rose blossoms ½ oz.

The chief perfumes obtained from animals are musk, civet, and ambergris. These animal perfumes are overpowering, and need to be diluted very considerably to render them pleasant.

Liquid perfumes are prepared by dissolving a relatively small quantity of the essential oil, or a mixture of oils, in pure alcohol. So-called *fixateurs* are used, e.g. benzyl salicylate, and it is claimed that they assist in the retention of the perfume.

Besides the use of essential oils in all branches of perfumery, some of them have a wider application as flavouring essences in confectionery and cookery, also in liqueurs, in non-alcoholic drinks, and in pharmaceutical preparations.

The artificial perfume industry is one of recent but rapid development, and now produces large quantities of perfumes and flavouring essences. Successful substitutes for the perfumes of the rose, lily-of-the-valley, lilac, violet, &c., are now being sold. The first notable step was made by Perkin in 1868, when he prepared coumarin, a chemical substance to which the perfume of the tonquin bean is due. In many cases the substance to which the perfume of the natural oil is due is manufactured chemically and used as a substitute for the natural perfume, e.g. benzaldehyde is used instead of oil of bitter almonds. In other cases substances not occurring in the natural oil but possessing a similar perfume are used as substitutes; nitro-benzene, e.g. which smells like bitter almonds, is used for scenting cheap soap. In otto of rose the principal ingredient is geraniol. Wintergreen owes its scent to the presence of methyl salicylate, and pineapple its fragrance to ethyl butyrate.

Per′gamus, or **Pergamum**, an ancient city of Mysia, in Asia Minor, north of Smyrna, represented by the modern Bergama. Pergamus was famous for its manufacture of parchment, which derives its name (*Pergamena charta*) from this place. Many fine remains testify to the ancient splendours of the city, and extensive excavations have been carried out since 1878 with excellent results. The remains of the great altar of Zeus, erected during the reign of Eumenes II (197–159 B.C.), and the ruins of a Roman theatre and circus have been found.

Pergamus was founded by Pergamus, son of Andromachus, and was conquered by Alexander, becoming then the property of Lysimachus. For many years an independent monarchy, it ultimately fell to the Romans, and then to the Arabs in 1336. Pergamus was one of the first towns to embrace Christianity, and was one of the seven churches of Asia addressed by St. John in his apocalyptic epistles (*Rev.* ii, 12–17).

Pergole′si, Giovanni Battista, Italian musical composer, born in 1710, died in 1736. He studied at the conservatory of music at Naples, produced his first oratorio and his first opera in 1731, and was appointed chapel-master at Loretto in 1734. His sacred compositions and his chamber music rank high in the history of music. Among Italian composers Pergolesi is noted for the purity of his style.

Pe′rianth, in botany, the floral envelope, the calyx and corolla, or either. This term is applied when the calyx and corolla are combined so that they cannot be satisfactorily distinguished from each other, as in many monocotyledonous plants, the tulip, orchis, &c. The perianth is called *single* when it consists of one verticil, and *double* when it consists of both calyx and corolla.

Pericardi′tis, inflammation of the membranous sac (pericardium, q.v.) containing the heart. In the acute stage of the disease there is exudation of lymph or serum; at a later stage false membranes are formed; and at a still later stage the two sides become glued together, forming adherent pericardium. This is generally followed by changes in the substance of the heart, or in its internal surface, orifices, or valves, and a fatal termination is rarely long delayed. The symptoms of pericarditis are: pain, more or less acute, in the situation of the heart; fever is present, with loss of appetite and dry tongue. An anxious respiration and a feeling of overwhelming oppression are also present, with frequent sighing, which gives momentary relief. Most of the symptoms are aggravated by motion or a high temperature. For the diagnosis of pericarditis we must rely mainly on the physical signs, but it is only when the effusion is considerable that investigation by percussion is of much use. In ordinary cases, where adhesion takes place, there may be an apparently complete recovery at the end of three weeks or less; but adhesion frequently gives rise to other structural changes of the heart, and then fatal disease of that organ almost always follows. In slight cases a real cure without adhesion may be effected.

Pericar′dium, the investing fibro-serous sac or bag of the heart in man and other animals. In man it contains the heart and origin of the great vessels. It consists of two layers, an outer or *fibrous* and an inner or *serous* layer. The inner surface of the membrane secretes a serous fluid, which in health is present only in sufficient quantity to lubricate the heart, and so to facilitate its movements within the sac.

Per′icarp, in botany, the seed-vessel of a plant, or the whole case or covering in which the seed is enclosed. The pericarp often consists of very distinct layers, as in the plum and other drupes, in which the external skin forms the *epicarp*, the pulp or flesh the *mesocarp*, and the stone which encases the seed the *endocarp*. Pericarps receive such names as capsule, silique, legume, drupe, berry, nut, &c.

Per′icles (-klēz), Athenian statesman, the greatest of ancient Greece, born about 490 B.C., died 429. He was the son of Xanthippus, a celebrated general who won a victory over the Persians at Mycale, and his instructors were Anaxagoras and Zeno of Elea. He was connected by family relations with the aristocracy, but as Cimon was already at its head he endeavoured to gain the favour of the popular party. In this he fully succeeded by his eloquence, abilities, and political tactics, so that on the death of Cimon, in 449 B.C., Pericles became virtual ruler of Athens. By his great public works he flattered the vanity of the Athenians, while he beautified the city and employed many labourers and artists. His chief aim was to make Athens undoubtedly the first power in Greece, as well as the chief centre of art and literature, and this position she attained and held for a number of years. At the commencement of the Peloponnesian War (431 B.C.), in which Athens had to contend against

Sparta and other states, Pericles was made commander-in-chief. The Spartans advanced into Attica, but Pericles had made the rural population take refuge in Athens and refused battle. After they retired he led an army into Megaris, and next year he commanded a powerful fleet sent against the Peloponnesus. In 430 B.C. a plague broke out at Athens, and for a brief period Pericles lost his popularity and was deprived of the command. The people, however, soon recalled him to the head of the state, but amid his numerous civil cares he was afflicted by domestic calamities. Many of his friends, and his two sons, Xanthippus and Paralus, were carried off by the plague; and to console him for this loss the Athenians allowed him to legitimize his son by Aspasia. He now sank into a lingering sickness, and died 429 B.C., in the third year of the Peloponnesian War. By the death of Pericles Athens lost her most distinguished citizen, a man whose intellectual breadth, elevated moral tone, and superiority to the prejudices of the age had placed him above his compatriots. His name is connected with the highest glory of art, science, and power in Athens. The golden age of Grecian art ceased with Pericles.—BIBLIOGRAPHY: Thucydides, *History* (Book i and Book ii, 1–65); W. W. Lloyd, *The Age of Pericles.*

Peridineæ, a group of minute unicellular plants, with brown chromatophores. They form a large proportion of the ocean plankton, and play an important part as food for various marine animals.

Per′idot, a name given by jewellers to the green transparent varieties of olivine. It is usually some shade of olive-green or leek-green. Peridot is found in Brazil, Arizona, New Mexico, and Egypt. It is softer than most gem-stones, is difficult to polish, and liable to lose its lustre. See *Chrysolite.*

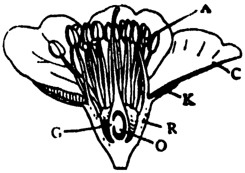
Peridotite, any igneous rock specially rich in olivine, and entirely or almost devoid of felspar.

Perigee (-jē), that point in the orbit of the moon which is at the least distance from the earth. See *Apogee.*

Périgord (pā-ri-gōr), a pre-Revolutionary province of France. It formed part of the military government of Guienne and Gascony, and is now represented by Dordogne and part of Lot-et-Garonne.

Périgueux (pā-ri-*geu*; the *Vesunna* mentioned by Cæsar), a town of France, formerly capital of Périgord, now chief town of the department of Dordogne, on the Isle; a junction on the Orléans Railway. The cathedral of S. Front, built between 984 and 1047 (according to some authorities at the beginning of the twelfth century), was restored in the latter half of the nineteenth century. There are bombazine- and serge-factories, iron- and copper-foundries, and a large trade in flour, wine, brandy, and the famous *pâtés de Périgord.* Pop. (1911), 33,550.

Perigynous Flowers, those in which the receptacle forms a cup, with the sepals, petals, and stamens inserted on its margin, the gynœcium being enclosed in the cup but not fused with it; the rose is a good example.



Section of Perigynous Flower

R, Receptacle. K, Calyx. C, Corolla. A, Andrœcium. G, Gynœceum. O, Ovule.

Perihe′lion (Gr. *peri*, near, and *hēlios*, the sun), that point in the orbit of the earth or any other planet which is at the least distance from the sun. The ‘perihelion distance’ of a heavenly body is its distance from the sun at its nearest approach.

Perilla, a genus of Labiatæ. *P. nankinensis*, an annual herb with deep purple leaves, is a favourite bedding plant.

Perim, a British island in the Strait of Bab-al-Mandeb, at the entrance to the Red Sea, about 10 miles from the Abyssinian and 1½ miles from the Arabian shore. It has been held by Great Britain since 1857, and is under the Residency of Aden. It is of consequence from its commanding position, which renders it the key of the Red Sea. On its south-west side is a well-sheltered harbour. Communications are maintained by submarine cable with Aden, Egypt, and Zanzibar. Area, 7 sq. miles; pop. (including garrison), 200.

Periodicals are publications which appear at regular intervals. They range from newspapers other than the dailies to reviews and magazines published quarterly, or even half-yearly, and embrace every conceivable interest from the popular and the flippant to the abstruse and the learned. In recent years they have been affected by the amazing development of the daily newspaper, and their evolution is still proceeding. The whole gamut of their activity now comes within the scope of the daily paper. From the extremes of the absurdly comic to the profoundly serious, the dailies have made remarkable inroads into their once special preserves, and the periodicals have had to condition themselves accordingly. One great advantage the periodicals possess over the newspaper—time for consideration of subjects and for printing. This affords scope for more reasoned treatment in the monthly reviews and for a better and more artistic style of printing, a matter of importance with regard to illustrations. Yet, in dealing with general topics and particularly politics, the periodicals are frequently at a disadvantage as compared with the dailies. The latter by going to press several times daily are regularly more up-to-date, owing to the fact that the weeklies and the monthlies are compelled to print a day or even a week in advance of publication. This is a factor which is bound to militate against the general periodical more and more as the technical facilities for rapid treatment of news are improved. The weekly newspaper has already suffered. Once it was the indispensable adjunct of every home; now its special features are incorporated in the daily press, and its need is passing. To a lesser extent the same law applies to the weekly and monthly reviews and even the magazines. Special and expert articles appear in the dailies, in instalments when they are of great length; short stories and serials are now established features of the daily paper, and no longer stamp the periodicals with a character once their own. In some degree, also, the same is to be noted of trade periodicals and publications of a propagandist character. Many newspapers have regular columns dealing with scientific and trade subjects, and, moreover, they cater for the advertisers interested in those matters. They have thus invaded the peculiar province for which class periodicals have been established—a means of inter-communication in the particular sphere. An instance of this is the theatrical page every Thursday in *The Daily Telegraph*, with its columns of advertisements preferred by many actors and actresses to those of the theatrical journals. As for propaganda organizations, a notice in the columns of the dailies with their huge circulations is obviously of greater value than the distribution of a periodical with a limited issue which probably reaches the converted only. Women and even children are increasingly catered for in the dailies, and with everything regarded from the point of 'news' calculated to interest some section of the vast daily newspaper clientele, the need of the periodical becomes steadily lessened. Nevertheless, the periodicals have still a considerable future. Many of them, local, religious, and trade journals, for instance, deal intensively with subjects which always will appeal to certain classes; highly technical and scientific matters cannot be treated exhaustively in the general press, which must inevitably aim at the 'popular' view. The size of the average periodical is an important item in its favour. Not only is it more convenient to read, but it is easier to keep and file for reference. Even to the great mass of readers of ephemeral matter the periodical offers attractions. Since education became compulsory and general, the reading public has grown to enormous proportions, and publications of the *Tit-Bits* variety will always be popular. It was a stroke of genius on the part of the late Sir George Newnes, who founded that paper, to realize the desire for that kind of reading. Much of the *Tit-Bits* matter finds its way into the daily press, but masses of people love to take up a paper devoted to light literature only. Conversely, there are serious-minded people of every gradation, from the perfectly normal to the extreme crank, who prefer to devote time to concentrated study of special subjects in periodicals.

Fiction and picture magazines have their particular public, and the artistic excellence of the illustrations is not only a delight to the readers, but a circumstance which advertisers take into calculation in their anxiety to catch the eye of the people. Colour printing is still beyond the capacity of the daily paper, but it is an increasingly important feature of trade journals and other periodicals. A class of periodical still in its infancy and likely to expand is that issued by large firms for their own workers. This is a development of the club and society magazine, to which the employees and clients of the firm are encouraged to contribute. To some of these periodicals famous writers are already contributing. Periodical publications which are quite frankly of an advertising character are also issued by some large business houses, with features devised to meet popular tastes. Theatrical programmes are also developing on these lines, and some football-match programmes partake of the nature of popular publications. The *cacoethes scribendi* will ever be a human impulse, and wherever men, women, or children congregate for a common object, be it in school, or in camp, or in workshop, sooner or later, if the association be in any way keen, the desire will express itself to secure a printed record. Some of the most interesting periodicals the world has known have been the outcome of such efforts.—BIBLIOGRAPHY: J. B. Williams, *History of English Journalism to the Foundation of the Gazette*; Street's *Newspaper Directory*.

Periodic Table, The. The accompanying table shows the Periodic System (see *Chemistry*) in a form well adapted for the study of the elements in their chemical relationships. Above the symbols of the elements are the atomic numbers, below them are the atomic weights. Apart from hydrogen, the table comprises two short periods of eight elements each; two long periods, each of eighteen elements, complete except for an element following Mo; and three partial long periods, the gap between Ce and Ta being filled by the rare-earth metals. Notwithstanding the spaces that appear vacant in the lower part of the table, the sequence of atomic numbers indicates that only five elements remain undiscovered: two members of the

PERIODIC TABLE

							1 **H** 1·008
2 **He** 4·00	3 **Li** 6·94	4 **Be** 9·1	5 **B** 10·9	6 **C** 12·005	7 **N** 14·008	8 **O** 16·00	9 **F** 19·0
10 **Ne** 20·2	11 **Na** 23·00	12 **Mg** 24·32	13 **Al** 27·1	14 **Si** 28·3	15 **P** 31·04	16 **S** 32·06	17 **Cl** 35·46

SHORT PERIODS

0	1	2	3	4	5	6	7	GROUP 8			1	2	3	4	5	6	7
18 **A** 39·9	19 **K** 39·10	20 **Ca** 40·07	21 **Sc** 45·1	22 **Ti** 48·1	23 **V** 51·0	24 **Cr** 52·0	25 **Mn** 54·93	26 **Fe** 55·84	27 **Co** 58·97	28 **Ni** 58·68	29 **Cu** 63·57	30 **Zn** 65·37	31 **Ga** 70·1	32 **Ge** 72·5	33 **As** 74·96	34 **Se** 79·2	35 **Br** 79·92
36 **Kr** 82·92	37 **Rb** 85·45	38 **Sr** 87·63	39 **Y** 89·33	40 **Zr** 90·6	41 **Nb** 93·1	42 **Mo** 96·0	43	44 **Ru** 101·7	45 **Rh** 102·9	46 **Pd** 106·7	47 **Ag** 107·88	48 **Cd** 112·40	49 **In** 114·8	50 **Sn** 118·7	51 **Sb** 120·2	52 **Te** 127·5	53 **I** 126·92
54 **Xe** 130·2	55 **Cs** 132·81	56 **Ba** 137·37	57 **La** 139·0	58 **Ce** 140·25	(61 missing)												
		Rare Earth Metals			73 **Ta** 181·5	74 **W** 184·0	75	76 **Os** 190·9	77 **Ir** 193·1	78 **Pt** 195·2	79 **Au** 197·2	80 **Hg** 200·6	81 **Tl** 204·0	82 **Pb** 207·20	83 **Bi** 208·0	84 **Po**	85
86 **Nt** 222·4	87	88 **Ra** 226·0	89 **Ac**	90 **Th** 232·15	91 **Bv**	92 **U** 238·2											

LONG PERIODS

A SUB-GROUPS

B SUB-GROUPS

manganese family (43 and 75), to follow Mo and W respectively, one rare-earth metal (61), a halogen to follow Po (85), and an alkali metal to follow Nt (87).

In the short periods transition is from strongly metallic alkali metal to strongly non-metallic halogen. In the long periods there are A and B sub-periods coupled by triads of the eighth group, e.g. K to Mn and Cu to Br, coupled by Fe, Co, Ni. The members of these sub-periods in vertical columns constitute respectively the A and B sub-groups, e.g. K, Rb, Cs are sub-group 1A, and Cu, Ag, Au sub-group 1B. The elements of the B sub-groups are always on a lower level of metallic power than the corresponding elements of the A sub-groups, e.g. Cu is less metallic than K, Zn than Ca, Br than Mn; consequently they form volatile hydrides and alkyl-compounds, which are not formed by the A sub-group elements, and their oxides are more acidic than the corresponding oxides of the latter elements. Further, except in group 8 and sub-groups 1B and 2B, there is increase of metallic or decrease of non-metallic properties, with rise of atomic weight, i.e. from Li to Cs, and from F to I, but not from Ni to Pt, nor from Zn to Hg. So the strongest non-metals are found in the upper right-hand region of the table, and the strongest metals in the lower left-hand region. This is exemplified by F and Cs, the most intense non-metal and metal respectively.

The elements of the short periods are related to those of the long periods in the following way. In group 1 the alkali metals Li and Na belong to the remaining alkali metals K, Rb, Cs in group 1A. In group 2 Be and Mg are followed by Zn, Cd, and Hg in the B sub-group rather than by the alkaline earth metals of the A sub-group; and in all the succeeding groups the elements of the short periods are related to the corresponding elements of the B rather than of the A sub-groups.

In the long periods the relationships of the elements of the A sub-groups to the corresponding elements of the B sub-groups are noteworthy; for the greatest contrasts are found in the extreme groups, and the least in the more central groups. Thus the contrasts between the alkali metals and Cu, Ag, and Au, and between Mn and the halogens, are greatest, whilst the contrast between the elements of group 4A and those of group 4B is least. See *Chemistry*; *Isotopes*; *Matter*.

Perios'teum, the fibrous membrane investing the bones, and which serves as a medium for the transmission of the nutritive blood-vessels of the bone. The periosteum firmly adheres to the surface of bones (including the inside of the long bones), save at their gristly or cartilaginous extremities, and it becomes continuous with the tendons or ligaments inserted into bones. When the periosteum, through disease or injury, becomes affected, the blood-supply and nutrition of the bone suffer, and in consequence the bone-tissue dies or becomes *necrosed*, and is exfoliated or thrown off. When a bone is fractured, the periosteum plays an important part in the repair of the injury, new osseous material being deposited by the membrane.

Peripatetic Philosophy, a name applied to the philosophy of the school of Aristotle, derived either from the shady walk (*peripatos*) of the Lyceum, where the master lectured, or from the fact that he was accustomed to walk up and down with his disciples whilst he expounded to them his doctrines (Gr. *peri*, about; *patein*, to walk).

Generally speaking, Aristotle's philosophy is an empirical realism, i.e. particulars exist, but genera and species are only abstractions. Knowledge, however, is impossible through sense alone. Although the concrete particular claims reality, it is the universal alone that is the object of knowledge. The laws and causes of the world, Aristotle maintained, must be sought for not in the facts themselves but behind them, and motion necessarily presupposes a prime mover and a transcendent Deity.

The philosophy of Aristotle starts from his criticism of the Platonic doctrine of ideas, in combating which he is led to the fundamental antithesis of his philosophy, that between matter and form. The notion or idea of a thing is not, according to Aristotle, a separate existence different from the thing itself, but is related to the thing only as form to matter. Every sensible thing is a compound of matter and form, the matter being the substance of which the thing consists, while the form is that which makes it a particular thing (a stone, for example, and not a tree), and therefore the same as its notion or idea.

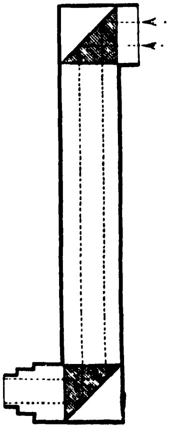
The form is the true nature of a thing. Origination is merely matter acquiring form; it is merely a transition from potential to actual existence. Everything that actually exists previously existed potentially in the matter of which it is composed. Matter is thus related to form as potentiality to actuality.

And as there is, on the one hand, formless matter, which is mere potentiality without actuality, on the other hand there is pure form, which is pure actuality without potentiality. This pure form is the eternal Being, styled by Aristotle the first or prime mover. The whole of nature forms a scale rising from the lower to the higher of these extremes, from pure matter to pure form, and the whole of nature is an endeavour of all matter to become pure form. Motion is the transition from the potential to the actual. Space is the possibility of motion. Time is the measure of motion. The universe is a vast sphere in constant motion, in the centre of which is our earth. On this earth, as in all nature, there is a regular scale of beings, the highest of which is man, possessed of reason. The soul, which is merely the animating principle of the body, and stands to the body in the relation of a form to matter, cannot be thought of as separated from the body; but the reason is something higher than that, and as a pure intellectual principle exists apart from the body, and does not share in its mortality. Practical philosophy Aristotle divided into ethics, economics, and politics. According to his ethical system, the highest good is happiness, which depends upon the rational or virtuous activity of the soul throughout life. Virtue is proficiency in willing what is conformed to reason.

The Peripatetic school continued at Athens uninterruptedly till the time of Augustus. Among the philosophers who proceeded from it, after the death of the master, were: Theophrastus, author of several works on natural history; Eudemus, the author or editor of the *Eudemian Ethics*, which are probably a recension of Aristotle's lectures; Critolaus, Diodorus, and Cratippus. These philosophers abandoned for the most part the metaphysical side of Aristotle's teaching, and chiefly developed his ethical doctrines. Strato of Lampsacus earned the title of 'the Physicist' by rejecting the principle of the *nous* or reason of Aristotle's system, and upholding nature as the source of all existence, even of thought. Later Peripatetics returned again to the metaphysical speculations of their master, and many of them distinguished themselves as commentators upon his works. Of these may be mentioned: Andronicus of Rhodes (58 B.C.); Nicolaus Damascenus (in the beginning of the Christian era); Aspasius (A.D. 80); Alexander of Aphrodisias (A.D. 200), the most celebrated of them all; and Boëthius, who translated the works of Aristotle into Latin. No one of the philosophical schools of antiquity maintained its influence so long as the Peripatetic. The philosophy of the Arabians was exclusively Aristotelian. We find the Peripatetic philosophy in the Christian Church as early as the time of the Arian controversy, and a Peripatetic sect, differing from the Scholastics, arose in the fifteenth and sixteenth centuries. Even in modern times the principles of Peripatetic philosophy have served as the rule in philosophical inquiries.—BIBLIOGRAPHY: Sir H. Jones, *The Schools of Philosophy*; E. Zeller, *Die Philosophie der Griechen.*

Perip'atus, a genus of primitive worm-like arthropods remarkable alike for their peculiar geographical distribution and their anatomical characters. They have soft, caterpillar-like bodies bearing from seven to twenty pairs of legs, each leg ending in a pair of claws. There are two jaws, each armed with a pair of cutting blades. They have antennæ and two simple eyes, and their respiratory system consists of tracheæ as in insects, but it is of a more rudimentary character. They live under stones and in rotting wood, defending themselves when molested by ejecting slime from two papillæ near the mouth. All species are viviparous. This genus probably represents an archaic type which connects together annelids and air-breathing arthropods. The first-known species came from St. Vincent, in the West Indies, but subsequent species have been found in Cape Colony, New Zealand, South America, and Australia. Some authorities group these animals in three or four different genera. They constitute a distinct class (Prototracheata) of air-breathing arthropods.

Periscope, a device used in submarines to observe the position of craft on the surface when the submarine is submerged. The periscope is enclosed in a long tube which projects through the roof of the submarine. It consists of a combination of lenses and prisms, arranged in such relationship as to provide a reflected image of whatever is in front of the lens and prism at the top of the periscope tube. Eyepieces at the foot of the tube are used for observation. Vertical and horizontal scales marked on a glass in the eyepiece fitment are useful in sighting the enemy craft before firing a torpedo. The periscope tube can be raised and lowered by gearing, can be turned round to get views of all the surrounding sea, and is provided with a valve which can be closed if the top part is destroyed by gun-fire or other cause. The combination of two simple mirrors on a collapsible frame to obtain the view of objects over obstructions has also been given this name. Such appliances were in use in the European War for observation from the comparative security of the trenches.


Diagrammatic Section of a Periscope showing how the image is reflected by the Prisms.

Perisperm, in botany, nutritive tissue in the ripe seed derived from the nucellus of the ovule; it is seen in seeds of pepper and waterlily.

Perissodac'tyla (Gr. *perissos*, odd, uneven; *daktylos*, finger or toe), one of the two great divisions of the order of Ungulata or hoofed mammals, the animals included in which are distinguished by the fact that the toes, numbering one or three, are odd or uneven in number. This term is opposed to the Artiodactyla or 'Eventoed' Ungulata. The horse, tapir, and rhinoceros comprise the three existing types.

Peristaltic Motion, or **Peristalsis,** is the name given to the motion arising from stimulation of involuntary muscles, and is seen in the intestines, when a ring-like contraction is produced at the point of stimulation and slowly passes along the tube. This peristaltic wave normally passes in only one direction, and so serves to drive on gradually the contents of the stomach and intestines, the lining of which contains involuntary muscle fibres.

Perithecium, in Fungi, a flask-shaped ascus-fruit, opening when ripe by a terminal pore; characteristic of Pyrenomycetes (q.v.).

Peritone'um, the serous membrane lining the abdominal cavity and covering the intestines and other organs. Like all other serous membranes, the peritoneum presents the structure of a closed sac, one layer (*parietal*) lining the abdominal walls, the other or *visceral* layer being reflected over the organs of the abdomen. A cavity—the *peritoneal cavity*—is thus enclosed between the two layers of the membrane, and this contains in health a quantity of serous fluid just sufficient to moisten its surfaces.

Peritoni'tis, inflammation of the peritoneum (q.v.). It is either acute or chronic, and the chronic form is either simple or tubercular. It may be caused by injuries such as a blow or a wound piercing the belly; is often the result of ulcerations of the stomach or bowels; and of diseases of liver, kidneys, &c.; and is sometimes a grave complication of septic conditions of the womb. The commonest cause perhaps is appendicitis. The symptoms are chiefly severe pain, increased by pressure, and fever. The only rational treatment of this grave condition is to remove the cause, usually by a surgical operation.

Periwinkle (Vinca), a genus of herbaceous or suffruticose plants of the nat. ord. Apocynaceæ or Dog-bane family. The greater and lesser periwinkle (*Vinca major* and *Vinca minor*) are hardy plants, which blossom in early spring, and are pretty common in woods, hedges, and thickets in many parts of Europe and in the south of England. Their flowers are of a fine blue colour, but when cultivated in gardens they may be made to yield purple and variegated flowers, both single and double.

Periwinkle (Littorina), a genus of marine snails, common on the British coasts. The shell is spiral, has few whorls, and is without a nacreous lining; the aperture is rounded and entire or unnotched (holostomatous). The common periwinkle (*L. littorea*) occupies the zone between high- and low-water marks, and is gathered and eaten in immense quantities. It is called the *wilk* in Scotland, in some parts simply the *buckie*, but is quite different from the mollusc called *whelk* (Buccinum) in England.

Perjury, the act or crime of wilfully giving false testimony in judicial proceedings in a matter material to the issue or cause in question. The penalties of perjury attach to wilful falsehood in an affirmation made by a Quaker or other witness where such affirmation is received in lieu of an oath. By the law of Moses (*Deut.* xix, 16), "If a false witness rise up against any man . . . then shall ye do unto him as he had thought to have done unto his brother". Gellius mentions that persons who had perjured themselves were thrown from the Tarpeian Rock. Perjury is a misdemeanour punishable by fine, imprisonment, or penal servitude. One who incites another to commit perjury (subornation of perjury) is liable to similar penalties. Popularly, the mere act of making a false oath, or of violating an oath, provided it be lawful, is considered perjury.

Perkin, Sir William Henry, English chemist, born at Shadwell in 1838, died 1907. He was educated privately and at the City of London School. After studying chemistry under Hofmann in the Royal College of Chemistry, London, he was appointed an honorary assistant to the professor. In a laboratory which he fitted up at home he conducted much of his early research work. During the Easter vacation of 1856, with the idea of synthesizing quinine, Perkin tried with a negative result the experiment of oxidizing a salt of allyltoluidine with potassium-dichromate. On repeating the experiment with aniline, however, he obtained a dark-coloured precipitate which proved to be a colouring-matter possessed of dyeing properties, and was the first aniline dye to be discovered. He resigned his college post, and with his father and brother started a chemical factory at Greenford Green. The new dye was patented in 1856 (Eng. Pat. 1984), and was manufactured under the name of aniline purple or tyrian purple; the name mauve, by which it was generally known later, was given to it in France. To Perkin's discovery of the first of the aniline dyes was ultimately due the supersession of vegetable by chemical dye-stuffs. Perkins continued his experimental work in pure and applied chemistry, and made many discoveries in the field of synthetic dye-stuffs. He was honoured by British, American, French, and German universities and learned societies.

His three sons, William Henry Perkin, Ph.D., D.Sc., F.R.S., professor of organic chemistry in the Victoria University of Manchester; Arthur George Perkin, F.R.S., professor of colour chemistry and dyeing, University of Leeds; and Frederick Mollwo Perkin, Ph.D., have all distinguished themselves in the same department of science as their father.

Perlis, the most northerly unfederated state of British Malaya, on the west coast, with a seaboard of 28 miles. It lies on the Siamese frontier, and is traversed by the western trunk line of the Malayan Singapore-Siam Railway (see *Malaya*). There are 17 miles of metalled and about 32 miles of other roadways. Kangar, on the River Perlis, is the capital. Tin and guano deposits are extensive throughout the state; rice is cultivated, with some rubber and coco-nuts. Area, 316 sq. miles (including the Island of Langkawi); pop. (estimated), 33,000 (seven-eighths Malay; the remainder Chinese and Siamese). Siam surrendered her sovereign rights in Perlis to the British Empire (1909), and the Sultan now rules under the advice of a British Resident.

Perm, an eastern government of Russia, partly in Europe and partly in Asia; area, 128,211 sq. miles. It is traversed by the Ural mountains. The government is rich in minerals, comprising iron, silver, copper, platinum, nickel, lead, and gold. Pop. 4,000,000.

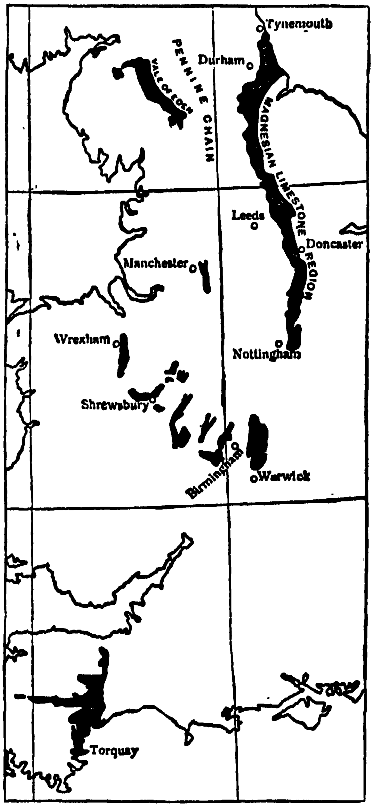
Perm, the capital of the Russian government of Perm, is situated on the Kama. It has flourishing industries in iron, steel, leather, and furs. The copper-mines, to which the town owes its existence, were discovered in the seventeenth century. In Dec., 1918, the town was captured by General Koltshak. Pop. 61,000.

Perman'ganate, any salt of the unstable acid permanganic acid, ($HMnO_4$). Potassium permanganate ($KMnO_4$) crystallizes in blackish lustrous needles, soluble in water, giving a deep purple solution. It is usually prepared by heating together caustic potash, potassium chlorate, and manganese dioxide, extracting with water and passing CO_2 through the liquid. The solution acts as a disinfectant and oxidizer. *Condy's fluid* is essentially a solution of sodium and potassium permanganates.

Permian, in geology, a system of rocks which received its name from covering an extensive area in the government of Perm in Russia. The system is poorly represented in Britain, but marine deposits of some importance occur in North America and India. The system succeeds the Carboniferous often without unconformity, and contains a Palæozoic flora and a notable development of primitive reptiles. The Permian period is also remarkable for the occurrence of an ice-age affecting lands now within or near the tropics.

Permissive Bill, a Bill which has been repeatedly brought before the British Parliament, and whose object is to empower a majority in any locality to veto, if so pleased, the issue of all licences for the sale of liquor in that locality. The principle of the Bill is known as *Local Option* (q.v.).

Permutations and Combinations, a section of algebra concerned with problems of arrangement and selection. The letters *a*, *b*, *c* can be arranged in 6 ways, viz. *abc*, *acb*, *bac*, *bca*, *cab*, *cba*. In other words, the number of permutations (or arrangements) of 3 things taken all together is 6. An arrangement may possibly not contain all the letters which appear in the question, e.g. we may wish to find the number of arrangements of 3 letters taken from the 5 letters *a*, *b*, *c*, *d*, *e*. To solve this problem, imagine a row of 3 boxes, into which the 3 letters are to be put. The first box may be filled in 5 ways, and after it has been



Map showing Distribution of Permian Strata in Britain. Ordinary types (conglomerates, sandstones, and shales) shown black; magnesian-limestone (dolomite) type shaded.

filled there are 4 letters from which to choose 1 to fill the second box. There are therefore 5×4 or 20 ways of filling the first two boxes, as may easily be verified by writing down all the possible ways, viz. *ab*, *ac*, *ad*, *ae*, *ba*, &c. In the same way it may be shown that there are $5 \times 4 \times 3$ or 60 ways of filling the 3 boxes, so that the number of permutations of 5 things taken 3 at a time is $5 \times 4 \times 3$. Similarly, the number of permutations of n things taken r at a time is $n(n-1)(n-2)\ .\ .\ .$ to r factors, the last factor being $n - r + 1$. As a special case, the number of permutations of n letters taken all together is the product of all the integers from n down to 1, or from 1 up to n. This product is an important number in many branches of mathematics; it is called *factorial n*, and is written $n!$. We can now easily deduce the number of ways of *selecting* r things out of n, the order of arrangement being a matter of indifference. For the r letters in any one selection can, as we have just seen, be permuted among themselves in $r!$ ways. Hence the number of permutations of n things taken r at a time is $r!$ times the number of selections. The number of selections (or combinations) of n things r at a time is therefore $\{n(n-1)(n-2)\ .\ .\ .\ (n-r+1)\} \div r!$. As an example, the number of ways of selecting 4 cards out of 52 is $(52 \cdot 51 \cdot 50 \cdot 49) \div (1 \cdot 2 \cdot 3 \cdot 4)$. The chance of the 4 selected cards being 4 specified cards, say the 4 aces, is the ratio of the number of favourable cases (which here is 1) to the total number of cases, i.e. the chance is $(1 \cdot 2 \cdot 3 \cdot 4) \div (52 \cdot 51 \cdot 50 \cdot 49)$, or 1 in 270,725. See *Probability*.

Pernambu'co, a north-eastern maritime state of Brazil. It is divided physically into three regions, viz. a coastal plain, low and wooded, but hot and humid; a high inland plateau, stony and dry, with hot days and cool nights; and an intermediate region of slopes and terraces, with light vegetation and a dry, bearable climate. The Rio de San Francisco traverses for a distance the southern boundary and, with its affluents, drains the inland plateau. Coastal streams include the Goyanna, Una, Ipojuca, and the Jacuhipe, a tributary of the Una, which on the south forms a part of the boundary with Alagôas state. Pernambuco is mainly devoted to agriculture, and produces sugar, coffee (in places), and fruit in the lowlands, cotton in the highlands, which are also devoted to stock-raising, and tobacco, maize, coco-nuts, bananas, and tropical produce in the intervening slopes. Cigar-making and cotton-weaving are the staple manufacturing industries. Railways are, the Sul de Pernambuco, Recife & São Francisco, Central de Pernambuco, and the line between Pernambuco and Timbauba, with branches—in all about 1800 miles, all of which have termini at Pernambuco. Pernambuco or Recife is the capital; other towns are Bezerros, Limoeiro, Bom Jardim, and Gloria de Goytá, averaging 20,000 inhabitants. Area of state, 49,560 sq. miles; pop. (1920), 1,975,441, or 39·8 persons to the square mile. Pernambuco is thus, after the Federal district and Rio de Janeiro, the most densely peopled state of the republic.

Pernambuco, or **Recife**, a seaport-city of Brazil, capital of the state of Pernambuco, the point upon which all the State railways converge, and the third city of Brazil. Ocean-going liners use the harbour, and there is also cable and wireless (from Olinda) communication. Coffee, rum, sugar, molasses, hides, rubber, and dyewoods are exported. Recife (Port. *Cidade do Recife*, the city of the reef), the alternative name for Pernambuco, is the name of an adjacent city now swallowed up by its larger neighbour. Pop. about 220,000.

Pernau, or **Pernov**, a port of Esthonia, at the mouth of the River Parnova, half a mile above the Bay of Pernau, a northerly arm of the Gulf of Riga. It was founded by a bishop of Oesel (1255), and was finally taken by the Russians in 1710. Pernau is a railway centre connecting with Riga, Petrograd, and Pskov, and the harbour is ice-free as a general rule between 23rd April and 9th Dec., or for about 230 days. Pop. 20,000.

Péronne, a town of France, in the department of Somme, on the Somme. It is of great historical interest, and was the scene of the starvation of Charles the Simple by the Count of Vermandois, by whom he was incarcerated about A.D. 928. It passed to Burgundy in 1435 by the Treaty of Arras, but was repurchased by Louis XI, and eventually capitulated to Charles the Bold (1465). Scott (*Quentin Durward*) describes Péronne and the castle in which Charles detained Louis XI. During the Franco-Prussian War it was bombarded from 27th Dec., 1870, to 9th Jan., 1871, when it capitulated because of an outbreak of smallpox. As a crowning misfortune Péronne was almost entirely devastated during the European War (1914–8). During their 'race to the sea' the Germans occupied the town (Sept., 1914), and held it until the Allied advance to the Hindenburg Line (March, 1917). During Ludendorff's supreme effort of 1918 (24th March) it was again lost to the Allies, but fell to the Australians, who stormed the protecting heights (Mont St. Quentin) in Sept., 1918. Péronne and Maricourt were 'adopted' by Blackburn. Pop. about 4000.

Peronosporaceæ, the principal family of Oomycetes, including many important parasites, e.g. *Phytophthora infestans* (potato-blight), *Plasmopara viticola* (false mildew of vine), *Bremia lactucæ* (lettuce mildew), and species of Peronospora, attacking maize, beet, onion, tobacco, &c.

Peroxides, a general name applied to oxides containing more oxygen than the ordinary oxide. A part of the oxygen is loosely combined and easily liberated, hence the peroxides are oxidizing agents. Examples are: barium peroxide (BaO_2), lead peroxide (PbO_2), and hydrogen peroxide (H_2O_2).

Perpendicular Style, in architecture, a variety of the pointed Gothic, the latest variety to be introduced, sometimes called the *florid* or *Tudor* style of *Gothic*. It prevailed in England from about the end of the fourteenth to the middle of the sixteenth century. It is chiefly characterized by the predominance of straight lines in the design, and especially in its tracery. Another feature is the lofty square towers of its churches, divided into stages by bands, and each stage filled with windows. The mullions of the windows are vertical, generally rise to the main arches, and are often crossed by horizontal bars or transoms. Large windows are a distinctive feature of this style. The tracery of the doors is similar to that of the windows. There are two kinds of roof peculiar to the style—the vaulted roof, with fan-tracery, and the open timber-roof. Nearly all the colleges of Oxford and Cambridge are specimens of it, and it is also exemplified more or less in many of the English cathedrals; while the majority of the old parish churches of England are also in this style.

Perpendicular Style, Abbey Church, Bath

Perpetual Motion. That motion is perpetual is obvious; in fact it would be impossible to point to a visible object which is absolutely at rest, to say nothing of the molecules of which every material object is composed, which we know to be continually in a state of violent motion. Even the solid earth on which we stand is subject to continual tremors, which are rendered visible by the seismograph. But the 'perpetuum mobile', the search for which has fascinated the minds of countless inventors throughout the centuries, just as the quest of 'the philosopher's stone' and 'the elixir of life' captivated the imagination of the alchemists, is a different problem from that of merely constructing something which will always be in motion. The problem is: to construct some mechanism or machine which will give out more energy than is put into it, and will continue to do so for an indefinite period.

Modern science has decided that 'the perpetual motion' in this sense is an impossibility, since it is absolutely inconsistent with the well-established physical generalization which is called the Law of the Conservation of Energy. The impossibility of 'the perpetual motion' was recognized by the Academy of Sciences of Paris as long ago as 1775, when it decided that no communication would be considered by it which claimed to solve the problem in question, classing it along with 'the squaring of the circle' and other mathematical impossibilities. But this decision has by no means suppressed the race of enthusiastic perpetuum mobilists, and the present writer has himself known several men who have worked for years at mechanisms, each continually hoping by modifications of design to overcome the remaining obstacles that prevent his machine from running of itself. Not many years ago a journal catering for engineering readers printed in its correspondence column a request for information "how to construct a small water-wheel which will pump its own water and drive a small dynamo". This is a type of the most ambitious class of attempts, in which a continual source of energy is sought by means of which useful work may be performed. The less ambitious perpetuum mobilist would be content with a machine which would simply keep itself moving, as, for example, a clock which would wind itself automatically.

One of the oldest and most frequently occurring types of perpetuum mobile is that of a wheel with radial grooves in which are heavy balls, so arranged that each ball, as it passes over the axle, rolls outward, and so descends with a greater leverage than those which are being raised in the other grooves. The machine described by the famous Marquess of Worcester was of this nature. Another such design is based on the rolling of a ball in a circuitous groove, which has to oscillate so that the ball will be running downhill and gaining speed more than it will be going uphill and losing speed. Other designs, such as that of John Bernoulli, the famous mathematician, are of hydraulic type. Others, again, utilize electric or magnetic attractions, or capillarity, or a combination of physical agencies. Though the true perpetuum mobile is impossible, it is quite practicable to construct a machine which, by tapping sources of energy that are always available, will continue to work for an indefinite time. A watch, for example, was constructed in Paris so that the variations of temperature between day and night were utilized to keep it automatically wound up, and it went without stopping for many years (perhaps does so still); but this in principle is not different from a hydraulic motor that is driven by the rise and fall of the tide in a marine dock. Such a machine obtains its supply of energy from without, and is no true perpetuum mobile. Vain as is the search for the perpetual motion, it has not been without indirect useful gains. It has sharpened the wits of many in things mechanical, and enabled them to achieve success in other directions. And the negative result of the search went far to establish the Law of the Conservation of Energy as a completely verified truth of natural philosophy, so that in a sense the many important deductions from that law may be said to have their ultimate basis in the failure of the perpetuum mobilists.—BIBLIOGRAPHY: Henry Dirck, *Perpetuum Mobile* (2 vols., 1861, 1874); A. de Morgan, *Budget of Paradoxes*.

Perpignan (per-pēn-yăṇ), a town of Southern France, capital of the department Pyrénées-Orientales, on the Têt. Guarding the entrance from Spain into France by the East Pyrenees, it is strongly fortified, has a citadel and other works, and ranks as a fortress of the first class. The city has much of the Spanish character. The principal building is the cathedral of S. Jean, founded in 1324 by Sancho II, King of Majorca. Perpignan was formerly the capital of the county of Roussillon, was long under Spanish rule, and was not united to France till the Treaty of the Pyrenees in 1659. Pop. 39,500.

Perrault (pā-rō), Charles, French author, born 1628, died 1703; superintendent of royal buildings under Colbert. His highly mediocre poem *Le Siècle de Louis le Grand* (1687) gave rise to the famous controversy on the comparative merits of the ancients and moderns, and the author was violently attacked by Boileau. He is best known by his *Contes de ma Mère l'Oye* (Tales of Mother Goose), the classic nursery tales of France, which have procured for him the title of 'inventor of the French Fairy Tales'. The first conte, *Grisélidis*, appeared in 1691, and among the others are: *Little Red Riding Hood*, *Bluebeard*, *Puss-in-Boots*, *Cinderella*, *Tom Thumb*, &c. He also wrote *Les Hommes illustres qui ont paru en France pendant ce siècle*. A monument was erected to his memory in the Jardin des Tuileries, Paris, in 1910.

Perry, a fermented liquor made from the juice of pears. It is analogous to cider, and is prepared much in the same way. Best perry contains about 9 per cent of absolute alcohol, ordinary from 5 per cent to 7 per cent.

Persecutions, the name usually applied to periods during which the early Christians were subjected to cruel treatment on account of their religion. Ten of these are usually counted. The *first persecution* (64–68) was carried on under Nero. The Apostles Peter and Paul suffered in this persecution. The *second persecution* (95–96) was raised by the Emperor Domitian. It is generally held that St. John was exiled to Patmos at this time. The *third persecution* began in the third year of Trajan (100). This persecution continued for several years in many parts of the empire, and the severity of it appears from the great number of martyrs mentioned in the old martyrologies. The *fourth persecution*, under Marcus Aurelius (161–180), raged with particular fury in Smyrna and Lyons, and Vienne in Gaul. Polycarp and Justin Martyr are famous victims of this period. The *fifth* began in 197 under Severus. During the *sixth persecution*, under Maximian (235–238), only Christian teachers and ministers were persecuted. Decius began his reign (249) with a persecution of the Christians (the *seventh*) throughout his dominions. This was the first really general persecution. Valerian in 257 put to death few but the clergy (*eighth persecution*); and the execution of the edict of Aurelian against the Christians (274)—the *ninth persecution*, as it was called—was prevented by his violent death. A severe persecution of the Christians (the *tenth*) took place under the Emperor Diocletian (303). Throughout the Roman Empire their churches were destroyed, their sacred books burned, and all imaginable means of inhuman violence employed to induce them to renounce their faith. Persecutions, principally directed against the clergy, continued with more or less vigour until Constantine the Great (312 and 313) restored to the Christians full liberty and the use of their churches and goods; and his conversion to Christianity made it the established religion in the Roman Empire.—BIBLIOGRAPHY: E. Gibbon, *Decline and Fall of the Roman Empire*; E. G. Hardy, *Christianity and the Roman Government*.

Perseids, a stream of meteors the maximum of whose period of activity occurs about 9th to 11th Aug. They are so called because they seem to radiate from the constellation Perseus.

Perseph'onē (Lat. *Proserpina*, anglicized *Proserpine*), in Greek mythology, the daughter of Zeus and Dēmētēr (Ceres). While she was gathering flowers near Enna, in Sicily, she was carried off by Pluto, who made her his wife. In answer to the prayers of Dēmētēr she was permitted to spend the spring and summer of each year in the upper world. In Homer she bears the name of Persephoneia. The chief seats of the worship of Persephonē were Attica and Sicily. In the festivals held in her honour in autumn the celebrants were dressed in mourning in token of lamentation for her being carried off by Pluto, while at the spring festivals they were clad in gay attire in token of joy at her return. The story of Persephonē is universally held to be a mythical account of the changes of the seasons, and the ancients themselves saw in the abduction of Persephonē a symbol of autumn, when the fruits of nature disappear, and in her return a symbol of spring.

Persep'olis, a Persian city of great antiquity, famous for its magnificent ruins. It is situated in a fertile valley of the present province of Farsistan. Its foundation is generally ascribed to Cyrus, although some credit Cambyses, but its history is involved in much doubt. It was one of Persia's capitals, and the place of burial for many of its monarchs; and it was the residence of Darius III when it was taken in 331 B.C. by Alexander the Great, who gave it up to pillage and destruction. The remains of large marble columns, vast portals, walls, huge figures, and bas-reliefs amply prove the former magnificence of its royal palace and temples.

Perseus (per'sūs), in Greek mythology, son of Danaë and Zeus. He was set adrift in the sea on his birth, in a chest along with his mother. But the chest reached the Island of Seriphos, and Perseus was brought up by the king of the island, who exacted a promise from him to fetch the head of the Gorgon Medusa. This he accomplished under the guidance of Hermes and Athena, and with the assistance of the nymphs. He also delivered Andromeda from a sea-monster, an exploit which is frequently figured in ancient art. He was King of Tiryns and founder of Mycenæ. After his death Perseus was worshipped as a hero, and placed among the stars.

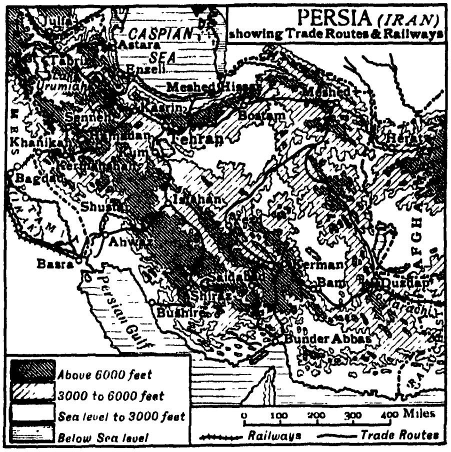
Perseus, the last king of the Macedonians, and an illegitimate son of Philip V, succeeded his father 178 B.C., and entered keenly into the hostilities which had previously broken out against Rome. The Romans sent an army against him and gained a signal victory at Pydna 168 B.C. Perseus fled to Samothrace, but was given up to the Romans, and some years after died in captivity at Alba, near Rome.

Perseus, a northern constellation surrounded by Andromeda, Aries, Taurus, Auriga, Camelopardus, and Cassiopeia. It is traversed by the Milky Way, and contains a magnificent double cluster of stars. A brilliant 'Nova' appeared in Perseus in 1901.

Pershing, John Joseph, American soldier, was born in Linn county, Missouri, on 13th Sept., 1860. He graduated from West Point, joined the 6th Cavalry (1886), was employed against the Apache (1886) and Sioux (1890) Indians, and was distinguished for gallantry during the Spanish-American War (1898). After being instructor at West Point, he was successively organizer of the bureau of insular affairs under the War Department (1899), general of the army operating against Mindanao in the Philippines (1902), and military attaché at Tokyo (1905–6), accompanying Kuroki's army in Manchuria during the Russo-Japanese War of 1905. From 1909 to 1913 he was Military Governor of the Moro Province, in the Philippines, and became brigadier-general of the 8th Brigade in California, where his wife and three daughters perished in the burning of the Presidio (Aug., 1915). In 1916 he led the American punitive expedition against General Villa (Mexico), and in May, 1917, he was called to command the United States Expeditionary Forces destined for Europe, and had a division in France during June of that year. He organized the Meuse offensive of the United States armies during 1918. In that year also he received the G.C.B., and in 1919 he was made a freeman of the City of London. He succeeded Peyton as Chief of Staff in 1921 with the rank of general.

Persia, a kingdom of Asia, occupying the western portion of the Plateau of Iran. The modern kingdom is not co-extensive with that of the Medes and Persians of remote history, but is to some extent of territorial dimensions equal to those of Persia Proper of scriptural and ancient history. The capital is Tehrān.

Physiography.—Modern Persia has been described as 'a sandy plain surrounded by mountains', and as such it is treated in some geographies. Although the general disposition of the interior mountain ranges is disputed, the Iran Plateau is believed to have an area of 628,000 sq. miles. It consists of a central area of plateau, rimmed by high mountains and two outlying lowlands. The central plateau is divided by a ridge of higher land into the *Dasht-i-Kavir* or Great Salt Desert in the north, and the *Dasht-i-Lut* or Great Sand Desert in the south. Both these zones are devoid of vegetation, and form one of the most desolate regions in the world. In the *Dasht-i-Kavir* are wide stretches of solid rock-salt.[1] The Elburz and Khorassan mountains mark the northern edge of the plateau, the Elburz forming a single range falling precipitously to the outlying lowland along the Caspian Sea, and reaching its culminating point in Mount Demavend (19,000 feet altitude). The Khorassan Mountains consist of two lower chains separated by a long valley running east and west. The Caspian littoral is long and narrow, but fertile. Serried ranks of limestone ridges, generally grouped as the Zagros Mountains, mark the western border of the plateau. They stretch from the region of Lake Van to the Persian Gulf, with an average width of 200 miles, the culminating point being Mount Kuh-i-Rang (12,800 feet altitude). In the south-west the Karun River basin forms a second area of outlying lowland. Along the eastern frontier the western mountains curve eastward to the mountains of Baluchistan, and the central deserts and depressions are carried eastward by the Seistan depression.



Climate.—Broadly, there are three climatic divisions. In the central plateau there are extremes of summer heat and winter cold, combined with a low rainfall and wide diurnal changes in temperature. The Caspian littoral, partly afforested, ranges as the altitude from sub-tropical to temperate conditions, with humidity and general conditions provocative of malaria and intermittent fevers. The lowlands of the Persian Gulf are exceedingly sun-scorched and unhealthy, with long spells of damp, enervating heat, and little or no rainfall.

Communications and Towns.—In any country that is almost entirely devoid of railways and water-ways, and where a subsidiary system of passable roads is non-existent, mankind invariably seeks the 'line of least resistance', and commerce tends to resolve itself largely into a question of trade routes (see map). The total railway mileage of Persia is only 850. At the head of the Persian Gulf the River Karun is open to navigation as far as Ahwaz. The Karun River joins the Tigris at Mohammerah, a river-port accessible to all ocean-going steamships that can cross the 'bar', and the 180 kilometres to Ahwaz can be accomplished by flat-bottomed boats at all seasons. A British company runs a weekly steamer service. From Ahwaz, Isfahān may be reached in from twenty to thirty days, according to season, and Shushtar by two steamers navigating the Upper Karun River. Basra is reached in three hours by motor, and Susa by like means in six hours. The principal ports in the Persian Gulf are Bushire, Lingeh, Bandar ‘Abbās, Chahbar, Jask, Mohammerah, and Abadan. Customs-houses for overland trade exist also at Ahwaz, Tehrān (pop. 230,000), Sehneh, Quasr-i-Shirin, Kermanshah (pop. 50,000), Luzdab, Nussrat Abad, Meshed (pop. 75,000), Kariz, Bunder Gaz, Meshedi Sar, Enzeli, Astara, Urmia, Tabriz (pop. 200,000), Khoi, Suj Bulag (Azerbaijan), and Julfa. Other towns are Isfahān (80,000), Kerman (75,000), Yezd (45,000), Barfurush, Shiraz (both 50,000), Hamadan, Kazvin, Kum, Kashan, and Resht (each with between 30,000 and 40,000 inhabitants).

The spelling of place names adopted here is that published by the Permanent Committee on Geographical Names, of the Royal Geographical Society. (*1st General List of Asiatic Names.*)

Production and Commerce.—Silk, wheat, barley, rice, fruits, gums (especially tragacanth), wool, cotton, opium, and carpets are produced. Mineral wealth is comparatively unexploited, but the Anglo-Persian Oil Company produces enormous quantities of petroleum from the Karun Valley (near Ahwaz mainly), and there are indications of oil all over Persia, but especially in the hinterland of Bushire, the Caspian littoral, and the Island of Kishm. There are important oil-refineries at Abadan. Turquoises are mined at Nishapur, and copper, coal, and salt exist throughout Khorassan generally. Along the Persian Gulf naphtha and rock-salt are the chief minerals. Kerman in the south produces copper, lead, manganese, borax, turquoise, iron, and mercury. Lingeh is a pearling centre. *Exports.*—The major portion of Persian exports have ordinarily consisted of commodities produced in the northern and central provinces, and exported across the northern frontiers to Russian and other markets. During the Russian Revolution and the subsequently unsettled period these goods could not be exported, and, on account of long and costly inland transport, their dispatch to any other frontier of Persia would not have been within the bounds of economic possibility. The exceptions are carpets, silks, and opium, which command monopolist prices, and would therefore show a profit in any case. Persia has ironically been described as "an estate of the Anglo-Persian Oil Company", and this is substantially true, for much of the national revenue is derived from royalties on Anglo-Persian oil production, and from Anglo-Persian expenditure on local supplies and services. Petroleum is the largest export, and the annual value is by far in excess of all the other exports combined. *Imports.*—Imports are mainly of sugar, cotton tissues, and tea, with rice, live-stock, and cotton threads in the second division of importance. The third class comprises iron and steel goods, pure-wool tissues, mercery and smallwares, machinery, and matches. *Great Britain.*—During 1920–1 British commercial interests in Persia were predominant, and exceeded those of all other foreign countries combined, 83 per cent of trade passing through British hands. Next in importance are Egypt, Russia, Belgium, and the Netherlands. As in the case of Paraguay, a considerable amount of trade goes to swell the statistics of other countries. The Anglo-Persian Oil Company makes large exports of oil and oil products to Egyptian ports for retransmission to final destinations. Mesopotamia is also a Persian transit country. See *Persian Gulf.*

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[1] The plateaux of Iran (Persia) and of Seistan (Afghanistan) are both areas of internal drainage. They are enclosed between the Elburz–Hindu-Kush on the north and the mountain loop of Persia and Baluchistan on the south. The rivers of these basins have no outlet to the sea, and, as is usual under such conditions, their floors are largely desert, the sheets of salt being deposited by the evaporation of the flood-waters.

Currency, Weights, and Measures.—There is a silver monetary standard, the unit being the *kran* (71 grains), and its exchange value has ranged in twenty years over all quotations between 18 and 70 to the pound sterling. 20 *shâhis* make 1 *kran*. Copper coins are the *pûl*; 2 *pûl* = 1 *shâhi*, 4 *shâhis* = 1 *abbâssi*, and 10 *pûl* or 5 *shâhis* = ¼ *kran*. Gold coins are of 2, 5, 10, ¼, ½, 1 *tomans*, but are not in circulation. 1 gold *toman* = 22 *kran*. The unit of weight is the *man* or *batman*, which is variable. The Tabriz *man* (*man-i-Tabriz*) is recognized everywhere. A *man* is made up of 40 *sir* or 640 *misgâls*, 16 *misgâls* being equal to 1 *sir*. 5 *sir* make an *abbâsi*, 8 of which are equal to 1 *man-i-Tabriz*. Roughly, a Tabriz *man* equals 7·27 Russian pounds, or 2·970 French kilogrammes, or 6 lb. 9 oz. English, in European terms of weight, but 6½ lb. is generally reckoned to the *man*. The *zar* or *gaz* is the unit of measure. A *farsakh* = 6000 *zar* of 44·09 inches = 4·17 miles, but is given as equal to 8½ miles in South Persia, and about 4 miles in the North.

Social Conditions.—The people of Persia are mainly Iranians, or pure Persians and Turanians. About three million nomadic Arabs, Turks, Kurds, Gipsies, and Baluchis are also indigenous. The European population does not exceed 1500 on any but the most extraordinary occasions. Three-quarters of the people embrace Shiite Mahommedanism, to which sect the Shah must belong, this being one of the essentials to succession. Of the remaining religions Sunnite Mahommedanism is pre-eminent, the others including Parsis, Armenians, Nestorians, and the inevitable Jews. The Persian priesthood is very powerful, but anyone who can read, understand, and interpret the *Koran* may become a mullah. Kerbela or Najaf is the principal seat of the priesthood. The Gregorian Armenians have two bishoprics, one seated at Tabriz, and the other at Isfahân. A bishop of the Roman Catholic Armenians resides at Isfahân, and another of the Latin rite at Urmia. Education is progressive, and is mainly developed on European principles. There is a polytechnic school at Tehrân with European professors. Military schools (at Tabriz and Tehrân), a political school, and a French school are all open.

Area and Population.—The area of Persia is about 628,000 sq. miles, divided into thirty-three provinces, and containing a population variously estimated at from 8 to 10 millions.

Government.—In Persia the Shah is virtually an absolute ruler. Officially he is called the *Shâhinshâh*, or King of Kings, which merely reflects the custom of most Mussulman countries, as, for instance, Abyssinia or Morocco, in flattering the ruler. Since Jan., 1906, a National Council has been officially in existence, but has never been constituted. Actual government is in the hands of the governors-general of provinces, who are called *Wâli* or *Hâkim*, and are assisted by governors of their own choosing. All towns have mayors, and each quarter of a town has its chief, as has also each of the nomadic tribes.

Defence.—The 'Cossack Division' is stationed at Tabriz. There are also two brigades of South Persia Rifles, with head-quarters at Shiraz and Kerman respectively, and one regiment stationed at Bandar 'Abbâs. All are efficient and have British officers.

History.—The original country of the Persians occupied a small portion of modern Persia on the north of the Persian Gulf. After being under the Assyrians, and next under the Medes, Cyrus (559–529 B.C.), by conquering and uniting Media, Babylonia, Lydia, and all Asia Minor, became the founder of the Persian Empire. The empire was further extended by his son and successor Cambyses (529–522 B.C.), who conquered Tyre, Cyprus, and Egypt; and by Darius I, who subdued Thrace and Macedonia, and a small part of India. His son Xerxes (486–465 B.C.) reduced Egypt, which had revolted under his father, and also continued the war against the European Greeks, but was defeated on the field of Marathon and at Salamis (480 B.C.), and obliged to defend himself against their attacks in a disastrous war. Artaxerxes I (465–425 B.C.) had a long and comparatively peaceful reign. Artaxerxes was followed by Darius II or Darius Nothus, Artaxerxes II (Mnemon), Artaxerxes III (Ochus), and Darius III (Codomannus, 338–330 B.C.), the last of this dynasty, known as the Achæmenian dynasty. He was defeated by Alexander the Great in three battles, lost his life, and the empire passed into the hands of his conqueror. On the dissolution of the Macedonian Empire, after the death of Alexander (323), Persia ultimately fell to his general Seleucus and his successors the Seleucidæ (312). They reigned over it till 286 B.C., when the last Seleucus was defeated and taken prisoner by Arsaces I, the founder of the dynasty of the Arsacidæ and of the Parthian Empire, of which Persia formed a portion, and which lasted till A.D. 226. The supremacy was then recovered by Persia in the person of Ardishír Babigán (Artaxerxes), who obtained the sovereignty of all Central Asia, and left it to his descendants, the Sassanidæ, so called from Sassan, the grandfather of Ardishír. This dynasty continued to reign for about 417 years, under twenty-six sovereigns. The reign of Sapor II, called the Great (310–381), and that of Chosroes I (Khosru, 531–579), were perhaps the most notable of the whole dynasty. The latter extended the Persian Empire from the Mediterranean to the Indus, from the Jaxartes to Arabia and the confines of Egypt. He waged successful wars with the Indians, Turks, Romans, and Arabs. Chosroes II (591–628) made extensive conquests, but lost them again in the middle of the reign of the Byzantine Emperor Heraclius. His son Ardishír (Artaxerxes) III, but seven years old, succeeded him, but was murdered a few days after his accession. He was the last descendant of the Sassanidæ in the male line. Numerous revolutions now followed, until Yezdigerd III, a nephew of Chosroes II, ascended the throne in 632 at the age of sixteen. He was attacked and defeated by Caliph Omar in 633–639, and Persia became for more than 150 years a province of the Mahommedan Empire. The Arab conquest had a profound influence on Persian life as well as on the language and religion. The old Persian religion was given up in favour of Mahommedanism, only the Guebres (q.v.) remaining true to the faith of their fathers.

About the beginning of the ninth century the Persian territories began to be broken up into numerous petty states. The Seljuks, a Turkish dynasty, who first became powerful about 1037, extended their dominion over several Persian provinces, and Malek-Shah, the most powerful of them, conquered also Georgia, Syria, and Asia Minor. Through Genghis Khan the Tartars and Mongols became dominant in Persia about 1220, and they preserved this ascendancy till the beginning of the fifteenth century. Then appeared (1387) Timour the Lame (Tamerlane) at the head of a new horde of Mongols, who conquered Persia and filled the world from Hindustan to the extremities of Asia Minor with terror. But the death of this famous conqueror in 1405 was followed not long after by the downfall of the Mongol dominion in Persia, where the Turkomans thenceforward remained masters for 100 years. The Turkomans were succeeded by the Sufi dynasty (1501–1736). The first sovereign of this dynasty, Ismail Sufi, pretended to be descended from Ali, the son-in-law of Mahomet. He assumed the title of Shah, and introduced the sect of Ali (the Shiite or Shiah sect). The great Shah Abbas (1587–1628) introduced absolute power, and made Isfahan his capital. Under Shah Soliman (1666–94) the empire declined, and entirely sunk under his son Hussein. A period of revolts and anarchy followed until Kuli Khan ascended the throne in 1736 as Nadir Shah, and restored Persia to her former importance by successful wars and a strong government. In 1747 Nadir was murdered by the commanders of his guards, and his death threw the empire again into confusion. Kerim Khan, who had served under Nadir, succeeded, after a long period of anarchy, in making himself master of whole of the Western Iran or modern Persia. He died in 1779. New disturbances arose after his death, and continued till a eunuch, Aga Mahomet, a Turkoman belonging to the noblest family of the tribe of the Kajars, and a man of uncommon qualities, seated himself on the throne, which he left to his nephew Baba Khan. The latter began to reign in 1796 under the name of Futteh Ali Shah, and fixed his residence at Tehrān. This monarch's reign was in great part taken up with disastrous wars with Russia and Turkey. In 1813 he was compelled to cede to Russia all his possessions to the north of Armenia, and in 1828 his share of Armenia. Futteh Ali died in 1834, leaving the crown to his grandson Mahomet Shah, during whose reign Persia became constantly weaker, and Russian influence in the country constantly greater. He died in 1848, and was succeeded on the throne by his son Nassr-ed-Din, born 1829. This ruler had to suppress a number of insurrections, and in 1851 a serious rebellion of the pure Persian party in Khorassan, who refused obedience to the Kajar dynasty on religious grounds. In May, 1852, he annexed the Sultanate of Herat, but was compelled to relinquish it by the British, and a second occupation in 1855 resulted in the landing of a British force on the Persian Gulf, the capture of Bushire, and the Peace of Paris (3rd March, 1857). Persia has since come into the possession of portions of territory formerly belonging to Omân, Afghanistan, and Baluchistan. On the north-east the boundary between Persia and the Russian territory beyond the Caspian, after remaining long uncertain, was settled in the end of 1881. The Shah was assassinated in 1896, and his son and successor, Muzaffar-ed-Din, abdicated in 1906 in favour of his son, Mahomet Ali. The Constitution of 1906 (see above) was bitterly opposed by the Shah, and the mullahs or priests who favoured the old absolutism. The Shah was deposed in 1909, and his son, Ahmed Mirza, a child of eleven, was placed on the throne. In 1924 a determined attempt to introduce a republican government met with failure, but in 1925 Ahmed Mirza, who had been absent from the country for over two years, was deposed and the government was handed over to Reza Khan, the Premier. In Dec., 1925, however, Reza Khan was made Shah, and his son became Crown Prince. In 1907 a convention was signed between Great Britain and Russia in reference to Persia, and fixing the respective spheres of influence of the two countries. This convention was recognized by Persia in 1912. In 1921 Persia entered into a full and binding treaty with Soviet Russia. Though neutral during the European War, Persia suffered much, being constantly fought over.—Bibliography: C. R. Markham, *General Sketch of the History of Persia*; A. V. W. Jackson, *Persia, Past and Present*; Sir P. M. Sykes, *A History of Persia*; E. C. Sykes, *Persia and its People.*

Language and Literature.—The oldest form of the language is called Old Bactrian or Zend. It is that in which the *Zendavesta* (or sacred Zoroastrian writings) was originally composed, and is very closely allied to the Old Sanskrit of the *Vedas*. The next development of the Iranian language is the Old Persian of the cuneiform inscriptions of the Achæmenian dynasty. We then lose sight of the Iranian language, and in the inscriptions and coins of the Sassanian kings, and in the translations of the *Zendavesta* made during the period of their sway in Persia, we find a language called Pehlevi or Pehlvi, which is strictly merely a mode of writing Persian, in which the words are partly represented by their Semitic equivalents. This curious disguised language is also known as *Middle Persian*. *New Persian* was the next development, and is represented in its oldest form in the *Shanameh* of Firdusi (about A.D. 1000). In its later form it is largely mingled with Arab words and phrases, introduced with Mahommedanism after the Arab conquest. The written character is the Arabic, but with four additional letters with three points. The Persians possess rich literary treasures in poetry, history, and geography, but principally in the former. Among the most brilliant of Persian poets are: Rudagi, a lyric and didactic poet (about 952), regarded as the father of modern Persian poetry; the epic poet Firdusi (beginning of eleventh century), whose most celebrated work is the poetical history the *Shanameh* (Book of Kings) in 6000 couplets; Omar Khayyam (died 1123), the author of celebrated *Quatrains*; Nisâmi (twelfth century), a didactic poet; Sadi (thirteenth century), a lyric and moral poet, author of the *Gulistan* (Rose Garden), a collection of stories; Rumi, his contemporary, a great mystic and didactic writer; Hafiz (born about the beginning of the fourteenth century), the most celebrated writer of odes; and Jami (fifteenth century), one of the most productive and most captivating of Persian poets. In the sixteenth century literary production almost ceased. The Persians are remarkable as being the only Mahommedan nation which has cultivated the drama. Their productions in this province of literature closely resemble the mysteries of the Middle Ages, and abound in natural and affecting lyrical passages. Not less numerous are the prose fables, tales, and narratives, many of which have been translated into English, French, German, and other European languages. It was also through the Persian that much of the Indian literature in fables and tales was transmitted to the Arabs, and thence to Europe. In the departments of history, geography, and statistics the Persians have some large and valuable works. Tabari is the earliest historian (died A.D. 922). Mirkhond, who flourished in the fifteenth century, wrote a voluminous work on the *History of Persia* down to 1471. Geometry and astronomy were also cultivated with ardour by the Persians, but their knowledge of these subjects is in a great measure borrowed from the Arabians. Religious works are also numerous; besides those treating of Mahomet and Mahommedan religion, they have translations of the *Pentateuch* and the *Gospels*, as well as translations of recent scientific and educational works.—Bibliography: E. G. Browne, *Literary History of Persia*; C. H. A. Field, *Persian Literature*; J. Darmesteter, *Les Origines de la poésie persane.*

Persian Gulf (ancient **Persicus Sinus**), a gulf separating Persia from Arabia, and communicating with the Indian Ocean by the Strait of Ormuz, 35 miles wide; greatest length, 520 miles; breadth, 150 to 200 miles. It receives the waters of the united Euphrates and Tigris, and of a number of small streams. There are many islands in the gulf; the largest are: Kishim, Ormuz, and the Bahrein Isles; in the neighbourhood of the latter there are lucrative pearl-fisheries. The principal port is Bushire; others are: Lingeh, Bandar 'Abbās, Chahbar, Jask, Mohammerah, and Abadan. During the year ending Jan., 1922, 902 steamers entered Persian Gulf ports, 868 of which were British, 29 Persian, 4 Swedish, 3 Dutch, 1 French, 1 Norwegian, and 1 American. 96 per cent of the steamer traffic is therefore under the British flag, which " seems but in accordance with the fitness of things that Great Britain, which for many years has policed and protected the Gulf, rid it of pirates, purged it of the illicit arms traffic, freed it from the slave trade, surveyed and charted it, buoyed and lighted it, and developed as far as practicable its ports, should now round off this long record of arduous service by performing the bulk of the commercial shipping movements" (Major Temple). Of sailing vessels, 3833 were Persian, 417 Arab, 205 British, and 2 Italian.—Cf. Major B. Temple, I.A.R.O., *Persia: Trade and Transport Conditions* (H.M. Stationery Office).

Persian Powder, an efficacious insecticide introduced from the East, and prepared from the flowers of the *Chrysanthemum carneum* or *roseum*, nat. ord. Compositæ, a native of the Caucasus and Persia.

Persian Wheel, or **Noria,** a machine for raising water to irrigate meadows, &c., employed from time immemorial in Asia and Africa, and introduced by the Saracens into Spain and other European countries. It consists of a double water-wheel, with float-boards on one side and a series of buckets on the other, which are movable about an axis above their centre of gravity. The wheel is placed in a stream, the water turns it, and the filled buckets ascend; when they reach the highest point, their lower ends strike against a fixed obstacle, and the water is discharged into a reservoir. In Portugal, Spain, south of France, and Italy this contrivance is extensively used; and has been modified to enable it to draw water also from ponds and wells, animals supplying the motive power, and pots, leather or other bags taking the place of buckets.

Persim'mon, the fruit of the *Diospȳros virginiāna*, a tree (a species of ebony) inhabiting the United States of America, more especially the southern states, where it attains the height of 60 feet or more. The fruit is succulent, reddish, and about the size of a small plum, containing a few oval stones. It is powerfully astringent when green, but when fully ripe the pulp becomes soft, palatable, and very sweet.

Per'sius (Aulus Persius Flaccus), Roman satirist, was born A.D. 34, and died A.D. 62. Little is known of his life, but it would seem to have been uneventful. He was well-born and rich, and lived the retired life of a student, surrounded by devoted female relatives. He was an intimate friend and pupil of the Stoic philosopher Cornutus, and was profoundly influenced in his life and thought by Stoicism. He died of some disease of the stomach at the age of twenty-eight, leaving behind him the reputation of having been a retiring, modest, and lovable man. His small book of six satires was posthumously published by his friends Cornutus and Bassus. It at once became popular. Owing to his earnestness and high moral tone Persius became a favourite author with the early Christian Fathers. He owes a considerable amount of his fame to the difficulty of his style. He has always been a happy hunting-ground for scholiasts of all ages and countries. His difficulty lies in obscure allusions as well as in recondite words. He was a student above everything else; and, unlike Shakespeare, he needed the spectacles of books to read nature. He derived most of his knowledge of life from Horace, and seemed more familiar with the Rome of Horace's *Satires* and *Epistles* than with the actual Rome of his own day. " Probably no writer ever borrowed so much and yet left on the mind so decided an impression of originality" (Conington). His opening satire on the literary taste of the day is perhaps the best of the six; but his most pleasing passages are those in which he speaks of himself and his gentle, studious life.—Cf. J. Conington and H. Nettleship, *Persius' Satires* (text, translation, and commentary).

Personal Actions, in law, are actions brought for the specific recovery of goods and chattels, or for the redress of breaches of contract or other injuries, in contradistinction to *real actions*, brought for the recovery of lands, tenements, and other heritable property.

Personalty, or **Personal Property,** movables; chattels; things belonging to the person, as money, jewels, furniture, &c., as distinguished from *real* estate in lands and houses. In the law of England the distinction between *real* and *personal* property is very nearly the same as the distinction between *heritable* and *moveable* property in the law of Scotland.

Perspective, the application of the rules of geometry, and in particular of projection, to representing solid objects on a plane surface, so that they appear to the eye as does the object itself. From every visible point on an object in space, rays of light pass to the eye of a spectator. The points in which these rays cut any vertical plane between the spectator and the object are the *projection* on that plane of the visible parts of the object; and together they make up on the plane an image which gives the same impression to the eye as the object itself. For example, if an object is placed behind an upright

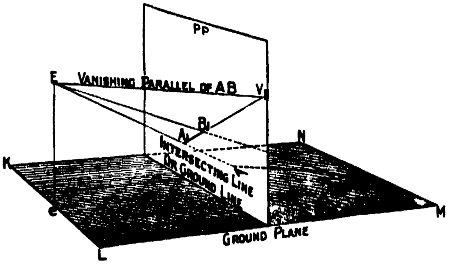


Fig. 1.—AB is a line lying on the ground plane KLMN. The plane PP is the picture plane. A line drawn from the eye E, parallel to AB, intersects the picture plane at V_1, the vanishing point of AB. A_1 and B_1 are the points of intersection with the picture plane of the rays of light from A and B to the eye, and the line A_1B_1 is therefore the perspective representation of AB. A_1B_1 passes through V_1.

sheet of glass, on which with a brush and ink the outlines of the object as seen through the glass are traced, this tracing will give a representation of the object. As, however, the light reflected to the eye from different parts varies in colour and intensity, to obtain a complete representation these variations should be recorded on the plane. Thus perspective is classed as *linear*, which is concerned with representing the shapes of objects and their position by means of lines; and *aerial*, which attains the same ends by means of variations in colour and in light and shade. In actual working, the plane on which the objects are to be represented is known as the *picture plane*, and is always regarded as vertical. The spectator is assumed to be standing on a horizontal plane extending an infinite distance; and the line in which this is cut by the picture plane is called the *ground line*. If there is a series of parallel lines passing through the picture plane and receding indefinitely, they appear to meet at the point on the picture plane where a line drawn from the eye parallel to the given lines cuts the picture plane. This is called their *vanishing point*. Similarly, a system of parallel planes cutting the picture plane and receding to infinity appears to meet on the line in which a plane parallel to the others and passing through the eye cuts the picture plane. This is known as their *vanishing line*. The line in which any plane cuts the picture plane is called its *near edge*; and that in which it cuts the ground plane, its *trace*. The vanishing line of all horizontal planes is, of course, a horizontal line on a level with the spectator's eye, and is called the *horizon*; and the point on it directly opposite the eye is the *point of sight*. It should be noted that, owing to the curvature of the earth's surface, the horizon in nature (where sea and sky appear to meet) is always slightly below the horizon in perspective. Since all lines on horizontal planes are themselves horizontal, their vanishing points always lie on the horizon; and parallel lines on a horizontal plane appear to meet in the same point thereon. Also, since all lines perpendicular to the picture plane are parallel to the line passing through the eye and the point of sight, all such lines vanish to the point of sight. These are the main conceptions, which, with their developments and applications, are fundamental in perspective. By their aid, any plane or straight line in space can be represented; and by means of *measuring points* and other devices, the exact size they appear to the eye can be represented. For representing recurring geometrical patterns, or rows of objects at equal intervals, perspective is especially valuable. By its means, also, the appearance of all the simpler geometrical forms, both plane and solid, can be given; and from this help obtained in dealing with more complicated and irregular forms. In practice, artists have sometimes used the *camera lucida* (q.v.) or *camera obscura* (q.v.) to assist them in dealing with complicated problems in working from nature. Historically, the theory and use of perspective is comparatively modern. It is doubtful whether it was known among the Greeks; and in Eastern art it has played no part. In the West, it first becomes important in fifteenth-century Italy, where its study proved peculiarly congenial to the restless scientific temperament of the Florentines, typified by Paolo Uccello. In the work of the Paduan school it played a prominent part, and soon became a regular element in artistic training. Scientific knowledge and artistic use, however, have not always moved together, and certain painters (for example, Canaletto) who relied much on perspective sometimes show a curious failure to grasp its principles, which results in surprising errors.—Bibliography: G. A. Storey, *Perspective*; R. Vicat Cole, *Perspective as applied to Pictures*; Lewes R. Crosskey, *Elementary Perspective.*

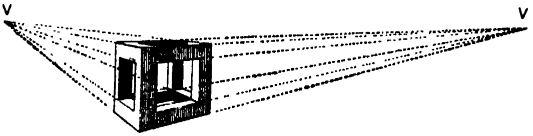


Fig. 2.—Perspective Representation of a Skeleton Cube

V, V_1, Vanishing points

Perspiration, or **Sweat**, is the secretion from the sweat-glands, which are found in the skin; in man they are most abundant on the palms and soles. Different animals vary much as to the amount of sweat they secrete, and the part of the body where it is most abundant. Thus the ox perspires much less than the horse or sheep, while perspiration is absent in the rat, rabbit, or goat. Pigs perspire mostly on the snout; dogs and cats on the feet. When the secretion is small, it is evaporated from the surface of the skin at once, and this is called insensible perspiration; but when it is increased or evaporation prevented, drops appear on the skin, and this is known as sensible perspiration. The drier and hotter the air the greater is the proportion of insensible to sensible perspiration. It is estimated that a man secretes 2 lb. of sweat in the twenty-four hours. The secretion of sweat is controlled by special nerve fibres, and varies with their stimulation, while certain drugs by paralyzing these fibres diminish perspiration. Sweat secretion is also affected by changes in the circulation. Sweat, usually acid in reaction, becomes alkaline when profuse. It has a characteristic odour, saltish taste, and a specific gravity of 1·005. It is largely made up of water, with various salts, fats, epithelial debris, and a trace of urea. It is an excretion whereby the body gets rid of waste products, and also in civilized conditions of life a factor affecting the heat regulation of the body.

Perth, a royal and municipal burgh, the county town of Perthshire, Scotland, on the Tay; served by the North British, Caledonian, and Highland Railways, which connect Aberdeen, Dundee, Glasgow, Edinburgh, and Inverness to a common station. The river and fine surrounding scenery give this city a most attractive appearance. The North and South Inches, two fine public parks, extend along the river bank, and a stone bridge, a girder bridge, and a railway bridge span the river. Among interesting buildings is St. John's Church, a thirteenth-century foundation which gave to Perth its early name of St. Johnstoun or St. John's Town, and in which John Knox preached his famous sermon against idolatry in 1559. The episcopal cathedral (St. Ninian's) is modern (1850–90), and there is a general convict prison. There are also infantry barracks. Perth is famous for dye-works, but has some manufactures, including ink, linen, brewing, iron-founding, and chemicals. It is a seaport, and has a traffic with Dundee and points along the coast. Perth has also some claims to be regarded as a Scottish holiday-resort. Pop. (1921), 33,208.

Perth was founded by Agricola in A.D. 69, and was known to the Romans as *Victoria*, remaining in their possession for over 300 years. It was a favourite seat of the Scottish kings, who held many Parliaments there. A charter was granted in 1106, but Perth was raised to the dignity of a royal burgh by William the Lyon (1210), and was the Scottish capital until 1482, when Parliament was transferred to Edinburgh. James I was assassinated by Walter, Earl of Atholl, at Blackfriars monastery (1437). Scott (*Fair Maid of Perth*) has described the combat between the Clan Chattan and the Clan Quhele which took place on North Inch in the presence of the king (Robert III) and his consort. During both '15 and '45 the magistrates remained loyal, although both Pretenders visited the town and the Old Pretender was actually proclaimed king at the Mercat Cross.—Cf. S. Cowen, *The Ancient Capital of Scotland.*

Perth, a city, the capital of West Australia, on the Swan River. There are Protestant and Roman Catholic cathedrals, a museum and art gallery, zoological park, and the University of West Australia. The city is served by electric tramways, and has several race-courses. With the Swan River Settlements, Perth was founded in 1829, and became a city in 1880. It became of importance on the local discovery of gold during 1890. Pop. (1921), 64,174.

Perth, The Five Articles of, a measure passed in a General Assembly of the Church of Scotland, convened in 1618 at Perth by the order of James VI, in his attempt to crush Scottish Presbyterianism. The first of these articles required communicants to receive the elements kneeling; the second permitted the dispensation of the communion privately in case of sickness; the third allowed private baptism on sufficient cause being shown; the fourth required that children of eight years should be confirmed by the bishop; and the fifth enjoined the observance of Christmas, Good Friday, Easter, Ascension, and Whitsunday. These articles were ratified by the Estates in 1621, but in the Assembly held at Glasgow in 1638 the Assembly of Perth was declared to be unlawful and null, and the Five Articles were formally condemned.

Perthshire, a county of Scotland, has an extreme length, east to west, of 68 miles; breadth, north to south, 60 miles; area, 1,664,690 acres, of which 32,000 are water. This county offers some of the finest and most diversified scenery in Scotland, some of the most fertile land in Britain, and agriculture may be seen here in a high state of perfection. The Grampians, which occupy the north and north-west of the county, culminate in several high peaks, including Ben Lawers (3984 feet), and the Ochil and Sidlaw ranges occupy the south-east. The principal rivers are the Tay, the basin of which comprises nearly the whole county; the Forth, Earn, Teith, Lyon, Garry, and Tummel. The chief lakes are Loch Tay, Loch Ericht, Loch Rannoch, and Loch Katrine. The chief agricultural district is the Carse of Gowrie, on the north bank of the Tay estuary. Sheep-farming is extensively carried on. The salmon-fisheries on the Tay are very valuable. Principal towns: Perth, Blairgowrie, Crieff, and Dunblane. Pop. (1921), 125,515.—*Cf. Perthshire* (in Cambridge County Geographies).

Per'tinax, Publius Helvius, a Roman emperor, born in A.D. 126, the son of a freedman. He distinguished himself in the army, and attracted the attention of Marcus Aurelius, who elevated him to the consulate in 179. During the reign of Commodus, Pertinax was employed in Britain and Africa, and finally made prefect of Rome. After the murder of Commodus he was proclaimed emperor in 193, but in three months was murdered by the prætorian guards.

Perturbations, the orbital irregularities or deviations of the planets from their regular elliptic orbits. These deviations arise, in the case of the primary planets, from the mutual gravitations of these planets towards each other, which derange their elliptic motions round the sun; and in that of the secondaries, partly from the mutual gravitation of the secondaries of the same system, similarly deranging their elliptic motions round their respective primaries, and partly from the unequal attraction of the sun on them and on their primaries. The perturbations of the moon are particularly large and difficult of computation, on account of the very large proportion which the influence of the chief perturbing body, the sun, bears to that of the earth.

Peru', a republic of the west coast of South America, with a seaboard of 1240 miles on the Pacific Ocean. It is divided into nineteen departments and three provinces as follows:

Division.	Area, English Sq. Miles.	Capital.
Department:		
Amazonas	13,943	San Carlos.
Ancachs	16,562	Haraz.
Apurimac	8,187	Abancay.
Arequipa	21,947	Arequipa.
Aijacucho	18,185	Aijacucho.
Cajamarca	12,538	Cajamarca.
Cuzco	156,270	Cuzco.
Huancavelica	9,251	Huancavelica.
Huanuco	14,024	Huanuco.
Ica	8,718	Ica.
Junin	23,347	Cerro de Pasco.
Lambayeque	4,614	Chiclayo.
Liberdad	10,206	Trujillo.
Lima	13,310	Lima.
Loreto	288,456	Iquitos.
Madre de Dios	24,747	Maldonado.
Piura	16,825	Piura.
Puno	41,198	Puno.
Tacna	12,590	Tacna.
Provinces:		
Callao	14	Callao.
Moquegua	5,549	Moquegua.
Tumbes	1,980	Tumbes.
Total	722,461	

These are divided into 118 provinces, subdivided into 980 districts.

Physiography.—Like Ecuador and Colombia, Peru is divided longitudinally into three clearly defined regions. (1) The coast, extending between the Pacific and the foot-hills of the Andes; an arid desert 20 miles in width, broken very occasionally by Andean streams. (2) The mountains (running from south-east to north-west), comprising the three chains into which the Andes are subdivided, viz. the Western Maritime Cordillera, the Cordillera Central, and the Cordillera Oriental, a region about 250 miles broad, divided into *sierras* or mountain slopes and valleys, and the *puna* or elevated wildernesses. The Maritime and Central Cordilleras are roughly parallel, and run at no great distance from each other. They are of different structures and ages, and contain many volcanoes, semi-active and quiescent. Peruvian geographers confine the term *Andes* to the Cordillera Oriental, which rises from the basin of the Amazon and forms the inner wall of the system. It is composed of very ancient rocks which are not volcanic, beds of limestone, probably deposited during the same period as the English chalk, resting upon the eastern flanks. As already noted, the main structural lines of the Cordilleras trend from south-east to north-west, though they may be deflected, as in Peru, by the influence of the older mountain system which has produced the sharp bending of the coast-line in the southern region of that country. The Cordillera Oriental rises in the south to Illampu and Illimani (more than 21,000 feet altitude), and is cut by six rivers, the Marañon, Huallaga, Perene, Mantaro, Apurimac, and Paucartambo. Numerous streams rise on the slopes of the Cordillera Central, which forms the true water-parting of the Peruvian-Andean system, and break through the Western Cordillera to the sea. Only one stream, the Marañon, pierces the Cordillera Central, which is connected with the Eastern Andes by the transverse mountain knot of Vilcañota. The Maritime Cordillera has no connection with the Chilian coastal range. It comprises a series of volcanic peaks overlooking the coast and rising to Lirima (19,000 feet) and Tocora (20,000 feet). North of the equator it bifurcates, the eastern area being the Cordillera Nevada, and the western the Cordillera Negra. (3) The third region is the tropical lowlands, the *Montaña*, lying in the basin of the Amazon, and skirting the eastern foothills of the Andes. It is traversed by great navigable rivers, including the Marañon, which is joined by the Huallaga and by the mighty Ucayali. In the south the component streams of the Beni form the drainage system. *Lakes.*—Lake Titicaca (q.v.) forms by far the largest body of fresh water in South America. Half of it is in Peru. Lake Junin or *Chinchaycocha* is drained by the Mantaro, one of the head-streams of the

Ucayali. It is 36 miles long by 7 miles broad, and stands at an altitude of over 13,000 feet.

Climate. — The climate depends upon the altitude. Just as in Mexico, there are the hot zone, the temperate zone, and the cool zone, but the great height of the Andes adds another belt, the Paramos or cold zone, which begins above the tree-line at an altitude of about 10,000 feet. The winds, mostly from the east, which blow over the eastern ridges of the Andes, deposit most of their moisture on the eastern slopes of these giant mountains, blow over the plateau, and over the Pacific slope generally, as cool dry winds, without yielding a drop of moisture. Dense fogs, however, the result of the meeting of the cold current that flows along the South American coasts with the warmer equatorial water, help to nourish the scanty vegetation of the coastal region during the winter season, and the temperature of the coast-lands is moderated by the sea breezes and by the cold ocean current along the coast. At Lima the temperature is moderate (about 68° F.), but, notwithstanding, the low coastal regions are anything but healthy.

Social Conditions: the People. — The inhabitants of Peru comprise pure whites, Asiatics (mainly Chinese), Africans, Indians, and mixed breeds, but the dominant race is mainly of Spanish-Indian extraction. The civilized Indians are represented by the *Quichua-Aymara* group of the *sierras* and the *Yuncas* of the Pacific slopes. In addition there are the savage Indian tribes of the Montaña, divided into *Cholos* (upland group) and *Zambos*, *Chunchos* or barbaros of the eastern forests. There has been no census since 1862, when the population was returned as 2,487,916, and all estimates (1908, 4,500,000) are pure guess-work. By an Act of Congress dated 30th Oct., 1920, a census is authorized. *Religion.*—Political and religious liberty is absolute under the terms of the Constitution (18th Jan., 1920), but the Roman Catholic religion is the faith of the state. The archbishopric of Lima dates from 1545, and there are thirteen bishoprics, two apostolic vicarages, and two apostolic prefectures. All property of the Church is the property of the State. *Education.*—Elementary education is nominally free and compulsory between the ages of seven and fourteen years, but the regulations are not enforced. A central university is located at Lima (founded 1551), and there are also universities at Arequipa, Cuzco, and Trujillo, and schools of mines, civil engineering, agriculture, and arts and trades established at the capital (Lima). Salt is a Government monopoly, which was created in 1896 to raise money for the ransoming of Peru's 'lost provinces', Tacna-Arica (q.v.). It produces about a quarter of a million pounds sterling per annum.

Currency.—Gold became the standard in 1901. The *libra* is equivalent in standard and weight to the pound sterling, which is also accepted. 10 *soles* = £1. Notes of 10*s*., £1, £5, and £10 gold value are in circulation, and there are also 50-cent nickel coins. Bronze coins are 1 and 2 *centavo* pieces (100 *centavos* = 1 *sol*). *Weights and Measures.*—The French system was established in 1869, and is in general use.

Towns. — The capital is Lima (pop. 1920, 176,470); Callao, the port of Lima, is also one of the best on the coast, and through it 70 per cent of Peruvian imports and 30 per cent of the exports are passed (pop. 1920, 52,843); others are Mollendo, Cuzco (pop. 10,000–15,000); Arequipa (35,000 – 40,000); Iquitos (12,000); Aijacucho (14,000), Huarás (7646), and Huacho (6000).

Transport and Communications. — In 1919 there were 347 miles of road suitable for motor traffic, and 576 miles in all (including projected roads). 90 per cent of the railways in active operation belong to the Peruvian Corporation, Ltd., a British syndicate. In 1918 there was a total working length of 1889 miles, 1358 miles being operated by the Corporation and officially classed as State lines.

Principal Lines.—1. Mollendo-Arequipa, 172 kilometres of standard gauge. Branches: (*a*) Ensenada Station to Pampa Blanco sugar estate; 2-feet narrow-gauge line. (*b*) Ramal Station to Sotillo; standard gauge. The ultimate destination is Moges Valley, 130 kilometres from Ramal.

2. Arequipa-Puno: 351 kilometres; standard gauge, 4 feet 8½ inches.

3. Juliaca-Cuzco: 338 kilometres; standard gauge; a branch of the Arequipa-Puno trunk line.

4. Cuzco-Santa Ana: 175 kilometres: 3-feet narrow gauge

5. Puno-Guaqui: steamer across Lake Titicaca; 120 miles.

6. Guaqui-La Paz: 67 kilometres; 1-metre gauge; 87 miles are steam and 10 miles electric traction.

7. Ilo-Moquegua: 98 kilometres; standard gauge.

1–6 belong to the Peruvian Corporation, excepting the branch from Ensenada. 7 belongs to the State, but is managed by the Corporation.

8. Paita-Piura: 60 miles; standard gauge.

9. Pacasmayo-Guadalupe: 63 miles; standard gauge.

10. Pisco-Ica: 46 miles; standard gauge.

11. Lima-Lurin: 28·5 miles; narrow gauge.

It will be noted that there is a trunk line from Arequipa to La Paz (Bolivia) via Puno and Lake Titicaca. Commercial aviation is practically non-existent. *Shipping.* — There are regular coasting services, and British, Dutch, American, Chinese, Chilian, Italian, French, Japanese, and German companies maintain trans-oceanic services at regular intervals—the majority sailing via Panamá if approaching from the Atlantic. *Wireless, &c.*—In 1919 there were nineteen wireless stations; three submarine cables connect Peru and Chile, and one connects Peru with the northern republics. The Marconi Company administers all posts, telegraphs, and wireless services for a period of twenty-five years commencing 1st May, 1921.

Production: Agriculture.—The principal products in order of importance are sugar, cotton, wool, hides and skins. The castor-oil plant is indigenous. Rice, wheat, barley, potatoes, coca (from which cocaine is made), a little wild rubber, and some wild sisal-hemp are also produced. *Minerals.*—Oil (petroleum), copper, silver, gold, vanadium ore, tungsten ore, salt, lead, molybdenum ore, antimony ore, bismuth, zinc, and borates are all worked. A little coal is worked, and there are some known fields of anthracite.

Commerce.—Peru is primarily an exporter of raw materials and an importer of manufactured goods, but there are more or less feeble manufacturing industries in brewing, tanning, iron-founding, flour-milling (one mill), match-making (one factory), cotton-seed oil, boots and shoes (one factory), hats (one factory), and mineral-waters. *Exports.* — The principal are sugar, copper, cotton, petroleum, and wool. *Imports.*— These are confined to textile bags, wheat, lumber, coal, and industrial oils.

Defence: Army.—Military service is universal and compulsory, and comprises two years active, seven years in first reserve, five in the second, and fifteen years in the national guard. There are five divisions, supplied respectively by the five military districts into which the country is divided. There are two battalions to a regiment, and each division comprises two or three regiments, one machine-gun company being allotted to each regiment, a regiment of mountain artillery, a cavalry regiment (two squadrons), a railway company, a labour company, a geographical section, and medical and commissariat services. Peace establishment is about 11,000 of all ranks, and there are 8000 police and gendarmerie. Armament comprises the 1912 Mauser rifle (Peruvian model), cavalry Mauser carbine, and Schneider Canet gun (artillery). There is a system of rifle-clubs, having an aggregate membership of 16,000 marksmen from 176 State-aided clubs. *Navy.*—There is a river flotilla on the Amazon comprising seven vessels. Two cruisers (3200 tons displacement, 24 knots speed) and a light cruiser, one destroyer, and two submarines complete the equipment for defence.

Government, &c.—The government is based on a Constitution adopted on 18th Jan., 1920. The legislative power is in the hands of a Senate of 35 members and a House of Representatives of 110 members, both elected by direct vote and totally renewed every five years. The President, elected for five years, is the head of the executive, and is assisted by two Vice-Presidents, both elected for five years also, but they take the place of the President only in case of his death or incapacity. The Presidents are also elected by direct vote, but the Vice-Presidents are not paid as such. Each department is governed by a Prefect, and each province by a Sub-Prefect, and there are also three regional Congresses, North, South, and Central, elected by the provinces.

History.—Of the early history of Peru we are almost entirely ignorant, but existing ruins, spoils secured by the Spaniards, and the descriptions left us by the historians of the Spanish conquest, sufficiently prove that the ancient Peruvians had no mean knowledge of architecture, sculpture, metal-work, &c. They also had made considerable progress in astronomical science. The early religion of the Peruvians is bound up in the god Viracocha, the creator of the sun and the stars, and from him the Incas or emperors claimed descent as the sons of the sun. Under the Incas the empire was divided into four parts, corresponding to the four cardinal points; each division had a separate government, presided over by a viceroy of royal blood. All the land belonged to the Inca; and trade was carried on by barter, money being unknown. The thirteenth monarch of the Incas was reigning when the Spanish adventurer Pizarro disembarked in Peru in 1531. The Inca was taken prisoner (1532), numbers of his subjects were massacred, and the whole country fell in a short time into the hands of the invaders. It was then formed into a Spanish viceroyalty; subsequently part of it was incorporated in New Granada, and the viceroyalty of Buenos Aires was constructed out of some of the provinces. In 1821 the country proclaimed its independence, but did not obtain actual freedom from Spanish rule until 1824, after a prolonged war. Since then Peru, like the rest of the South American republics, has suffered much from dissensions and revolutions. In the spring of 1879 Peru joined Bolivia in a war against Chile, which resulted in the complete defeat of both the former. Peru ceded the province of Tarapacá absolutely to Chile, who also obtained provisional possession of the provinces of Tacna and Arica, the Alsace-Lorraine of Latin-America (Treaty of Ancon, 8th March, 1884). A plebiscite to determine the ownership of these 'lost provinces' should have been taken in 1894 after ten years' occupation, but Chile has ignored this provision, and has carried out a gradual process of Chilianization, contracting for railways and generally exercising sovereign rights throughout Tacna and Arica. A conference was called at Washington by President Harding, when it was hoped that the matter would have been finally settled, but a deadlock was reached (May, 1922). Peru favoured the allied cause during the European War. See articles on departments, towns, &c.

Bibliography: C. R. Markham, *The Incas of Peru*; W. B. Parker, *Peruvians of To-day*; A. R. Hope Moncrieff, *New World of To-day* (with

economic data by Lionel W. Lyde); E. C. Vivian, *Peru*; F. W. Manners and H. A. Richards, *Finance, Industry, and Trade of Peru* (H.M. Stationery Office).

Peru, a city of Indiana, United States, the county seat of Miami county, on the Wabash River; served by the Wabash, the Lake Erie & Western, and the Chicago, Cincinnati, & Louisville Railways, and by electric-traction lines to Warsaw and Indianapolis. There are large railway shops, and Peru is an important produce-marketing centre. It was settled in 1834, and became a city in 1867. Pop. 13,000.

Peru Balsam, a resinous product obtained from certain species of Myroxylon, ord. Leguminosæ, natives of tropical America, used in medicine and perfumery. The *white Peru balsam*, a pale-yellow, transparent, and syrupy liquid, is produced from the inner coating and seed of the fruit; it hardens and becomes reddish on exposure to air, and is then called *dry, brown*, or *red Peru balsam*. By boiling the bark and twigs of the tree a dark-brown syrup, of vanilla-like odour, sharp and bitter taste, is obtained, the *black Peru balsam* of commerce.

Perugia (pe-rō'jiȧ), a province of Umbria, Central Italy, with which it is coextensive. It is traversed by the Apennines, watered by the Tiber, and contains the Lago Trasimeno (ancient *Trasimenūs Lacus*), which is 9 miles west of the city of Perugia. Minerals, including coal and iron, are worked in the mountains, and the valleys are rich producers of cereals, olive-oil, and wines. Area, 3770 sq. miles; pop. over 700,000.

Perugia (ancient **Perusia**), a town of Central Italy, capital of the province of the same name, on the Tiber. It is surrounded by old walls, and is rich in art and literary treasures, and has many remarkable buildings, including a Gothic cathedral of the fifteenth century (still unfinished), a number of churches and monasteries, a town hall (Italian-Gothic, begun 1281), and a university (founded in 1307). The manufactures are not of much consequence. Perugia was an old Etruscan city, and was conquered by Rome in 310 B.C. It was incorporated in the Papal States in the middle of the sixteenth century, and in 1860 passed to the Sardinians and became part of the new Kingdom of Italy. Pop. 70,227.

Perugino (per-u-jē'nō), properly *Pietro Vannucci*, one of the chief painters of the Umbrian school, was born at Citta della Pieve in 1446, died at Fontignano in 1523. He spent his youth in Perugia, whence he derived his nickname, and there studied under Fiorenzo di Lorenzo. Later he worked in Florence, and in 1480 went to Rome to assist in decorating the Sixtine Chapel with the frescoes commissioned by Sixtus IV. His art shows the mysticism and lyrical character of the Umbrians, and their fondness for spacious landscape settings. His earlier paintings are mainly in tempera, and show his qualities at their best. His later work in oil tends towards mannerism and repetition. Among his most characteristic and remarkable works is the fresco of the *Crucifixion* in the Church of Sta. Maria Maddelena dei Pazzi, Florence. He is represented in the National Gallery by a *Virgin and Child with St. John* and a *Virgin and Child with St. Francis and St. Jerome*, both typical works. His influence on subsequent painting was considerable. His most celebrated pupil was Raphael, whose earlier work especially owes much to his master.

Peruzzi (pā-rụt'sē), Baldassari, architect and painter of the Roman school, born at Sienna 1481, died at Rome 1537. He designed the Farnesina Villa on the banks of the Tiber, and he succeeded Raphael as architect of St. Peter's. His best existing works in fresco are at Sienna.

Pes'aro (ancient **Pisaurum**), a city and seaport of Italy, capital of the province of Pesaro-e-Urbino, near the mouth of the Foglia, on the Adriatic. It is the seat of a bishop. The fortress of the Sforzas, dating from 1474, still remains. The trade in the wine, fruit (particularly figs), oil, silk, and other products of the district is considerable. The composer Rossini was born here in 1792, and founded a conservatoire in the town. Pop. 28,500.

Pesaro-e-Urbino, a province of North Italy, in the Marches compartimento, lying between the Adriatic and the Apennines. Iron is worked in the mountains, and the rich valleys produce olive-oil, wine, cereals, and fruit. Sericulture is practised. Area, 1118 sq. miles; pop. over 270,000.

Pese'ta, the Spanish money unit, its nominal value being 9½*d.* The peseta, divided into 100 centimos, is coined in ½, 1, 2, and 5 silver, and 5, 10, 20, and 25 peseta gold pieces. In 1922 the peseta was worth about 8½*d.*

Peshawur, a district and town of the North-West Frontier Province of India. The district is a mountain-girt depression peopled by Pathans and some commercial Hindús. The Indus traverses the south-east, and the district is irrigated by the Swat River Canal. Cereals, cotton, and some sugar-cane are produced. From Attock to Peshawur the North-Western Railway traverses the district. Area, 2600 sq. miles; pop. (estimated), 800,000. The city of Peshawur is the capital of the North-West Frontier Province, and lies on the Bara, 12 miles from the eastern entrance to the Khyber Pass. There are cantonments 2 miles outside the native city, which makes Peshawur the chief garrison town on the frontier. Pop. 100,000.

Pessimism, the antithesis of optimism, is a term applied to the attitude of those who, either in consequence of the keen sense of evil and misery in the world, or as the result of a philosophical analysis of life, regard the universe, especially in its relation to man, as radically bad. Pessimism is thus either temperamental or philosophical. From time to time a note of pessimism is sounded among every nation, just as almost every individual may sometimes be on the verge of despair. As long, however, as nations or individuals are reacting against such a feeling of melancholy, their attitude cannot yet be termed pessimism. The real pessimist is he who always and persistently looks upon the dark side of things, and who maintains that existence is fundamentally bad and could not be worse. Just, however, as there are *meliorists*, i.e. those who admit that although the world is good it could be made better, so also there are *pejorists*, i.e. people who maintain that the world is evil but could have been worse. The Old Testament is generally optimistic, but here and there a cry of despair is uttered, as in *Job* and *Ecclesiastes*, i, 2–18 (" Vanity of vanities, all is vanity "). In the New Testament the pessimistic note is much stronger. A semi-philosophical pessimism runs through the whole doctrine of the ancient Brahmanical teachers of India, but it is in Buddhism that pessimism received its most definite formulation. The keynote of Buddhism is the idea that life is perfect misery. Neo-Platonism had a distinctly pessimistic character, and influenced many Christian mystics, who expressed opinions regarding the worthlessness of life and the evil of the world. As for literature, there is hardly a great poet who was not pessimistic at times. Homer and Hesiod, Theognis and Sophocles often utter a cry of despair, and the last maintained that " it were better for man not to have been born " (*Œdipus Coloneus*, line 1225). After the French Revolution, when a general disappointment had taken hold of humanity, when a feeling of *malaise* and unrest was noticeable everywhere, and a wave of pessimism swept over Europe, poets gave expression to this pessimistic feeling, and philosophers elaborated systems. Byron in England, Baudelaire and De Musset in France, Heine in Germany, Pushkin in Russia, and Leopardi in Italy uttered cries of despair and were pessimistically inclined. The two modern philosophers who propounded pessimistic systems were Schopenhauer (q.v.) and von Hartmann. The former, who based his theories upon the pessimistic side of Hegel's doctrine, came to the conclusion that death, being the negation of individuality, is the one good in life.—BIBLIOGRAPHY: J. Sully, *Pessimism*; R. M. Wenley, *Aspects of Pessimism*; A. Kowalevski, *Studien zur Psychologie des Pessimismus.*

Pestalozzi, Johann Heinrich, Swiss educationalist, and principal founder of modern pedagogy, born 1746, died 1827. He first studied theology, then law; and subsequently became concerned in a calico manufactory. Afterwards he devoted his time and substance to the children of paupers, whom he collected in large numbers in his own house, and this good work he carried on for over twenty years without outside aid or even sympathy. The want of means at last compelled him to abandon his gratuitous institution, and to seek pupils who could pay for their maintenance and instruction. After a few years' successful teaching in various places he opened a school in the Castle of Yverdon (canton Vaud), which the Government had placed at his disposal. His novel *Lienhardt und Gertrud* (Leonard and Gertrude, 1781–9, 4 vols.) exerted a powerful moral influence, while his educational treatises have laid the foundation for the more rational system of elementary instruction which now obtains in Europe. The grand principle that lay at the basis of Pestalozzi's method was that of communicating all instruction by direct appeal to the senses and the understanding, and forming the child by constantly calling all his powers into exercise, instead of making him a mere passive recipient, selecting the subjects of study in such a way that each step should best aid the further progress of the pupil.—Cf. J. A. Green, *Life and Work of Pestalozzi.*

Pestalozzia, a genus of Fungi Imperfecti, section Melanconiales. *P. Guepini* is a dangerous pest (grey blight) of the tea-plant in Assam. Collecting and burning of infected leaves is suggested as a remedy. *P. Hartigii* kills seedling Conifers.

Pétain, Henri Philippe, French soldier, was born at Cauchy-à-la-Tour, Pas-de-Calais, on 24th April, 1856. Educated at St. Cyr, he joined the infantry, and became a colonel in 1910. At the outbreak of the European War he was in command of the 4th Brigade, and gained military acclamation by his work in Artois during 1915. In September of that year he succeeded Castelnau in command of the Second Army, and took part in the Champagne offensive. In Feb., 1916, he assumed command of the troops before Verdun, and his brilliant defence of the fortress-city is one of the epics of the war. Subsequently he commanded the Armies of the Centre and, in May, 1917, he succeeded Nivelle as Commander-in-Chief in the north and north-east, retaining his command on the appointment of Foch as Generalissimo (March, 1918). He led the French into Metz on 19th Nov., 1918, and on that day was handed the baton of a Marshal of France.

Pet'alite, a rare mineral, a silicate of aluminium and lithium, containing about 4 per cent of lithia and as much as 78 per cent of silica. Its specific gravity is unusually low, only 2·4. It occurs in masses of foliated structure; colour white, occasionally tinged with red, green, or blue.

Petcho'ra, a river of Russia, rises in the north of the government of Perm, on the western slope of the Ural Mountains, and after a course of about 900 miles falls into a bay of the Arctic Ocean by a number of mouths.

Peter, the Apostle, commonly called Saint Peter, one of the twelve Apostles of Jesus Christ. He was a Galilean fisherman from Bethsaida, originally named *Simeon*, or *Shim'ōn*, the son of Jona, and brother of St. Andrew, who conducted him to Christ. Jesus greeted Simon with the significant words, " Thou art Simon the son of Jona; thou shalt be called Cephas " (in Gr. *Petros*, a stone, whence the name Peter). After the miraculous draught of fishes Peter became a regular and intimate disciple of our Lord. The impetuosity of his character led Peter, especially in the early days of his apostleship, to commit many faults which drew upon him the rebuke of his divine Master. His zeal and eloquence made him often the speaker on behalf of his fellow Apostles on important occasions, and his opinions had great influence in the Christian churches. On one memorable occasion he incurred the rebuke of the Apostle Paul in consequence of his behaviour towards the Gentile Christians in regard to social intercourse. Nothing certain is known of his subsequent life, but it is almost beyond doubt that he was a joint-founder of the Church at Rome, and that he suffered martyrdom there, most likely under Nero, about A.D. 64. The only written documents left by Peter are his two *Epistles*. The genuineness of the *First Epistle*, the authenticity of which has been denied by Rationalist critics, Harnack, and the Tübingen school, is placed beyond all reasonable doubt, both the external and internal evidence being of the strongest description. The authenticity of the *Second Epistle* has been disputed by numerous critics on what appears to be plausible grounds. Doubts of its genuineness already existed in the time of Eusebius, and it was not admitted into the New Testament canon till A.D. 393.—Cf. Taylor, *Peter the Apostle*.

Peter, the Cruel, King of Castile and Leon, born 1334, succeeded his father Alfonso XI 1350, and died 1369. His reign was one long series of cruelties and despotic acts. The year following his coronation he put to death Eleanora de Guzman, his father's mistress. In 1353 he married, though contrary to his will, Blanche of Bourbon, whom, however, he abandoned two days after his marriage in order to rejoin his mistress Maria Padilla. The queen was imprisoned and divorced, and his mistress's relations appointed to the highest offices. He then married the beautiful Juana de Castro, but only to abandon her after a few months. Dethroned in 1366, he was reinstated the following year by an army lent by Edward the Black Prince. Executions and confiscations naturally followed, but these fresh cruelties only helped to swell the ranks of his opponents, of whom the chief was his half-brother Henry of Transtamara. In 1369 Henry gained a signal victory over Peter at Montiel, and the latter was slain in a sword combat with his brother.

Peter, the Hermit, a monk of Amiens, whose preaching, after a pilgrimage to Jerusalem (end of the eleventh century), gave rise to the first Crusade. Peter led the way through Hungary at the head of an undisciplined multitude of more than 30,000 men, a comparatively small number of whom survived to reach their destination, and distinguished himself by his personal courage at the storming of the holy city. On his return to his native country he founded the abbey of Noirmoutier, and died its first superior in 1115.

Peter I (*the Great*), Alexeievitsh, Emperor of Russia, born 1672, died 28th Jan., 1725. He was the eldest son by his second wife of the Tsar Alexis Mikhailovitsh. Peter's half-brother Feodor, who succeeded his father in 1676, died in 1682. Peter then succeeded to the Tsardom jointly with his brother Ivan, a feeble-minded prince, whilst his sister Sophia was appointed regent. In 1689, however, Peter wrested the power from his sister, confined her in a convent, and was virtually sole emperor, though, till the death of his brother in 1697, he associated his name with his own in the ukases of the empire. He now determined to do what he could to raise his country out of its barbarism, and to place its people in the ranks of civilized nations. His journey to Holland and England (1697–8), when he practically worked in shipyards, is familiar; and the knowledge he there gained was amply profited by on his return. He not only created a navy, but gave Russia a seaboard and seaports by wresting the Baltic provinces from Charles XII of Sweden. Young Russian nobles were obliged to travel; schools of navigation and mathematics were founded; agriculture was improved by the introduction of implements, seeds, and superior breeds of cattle. Peter imported foreign artisans of all kinds, established manufactories of arms, tools, and fabrics, and distributed metallurgists through the mining districts of Russia; roads and canals were made to foster internal commerce, and to extend trade with Asia. In 1703 he laid the foundation of St. Petersburg (now Petrograd), and twenty years later of its Academy of Sciences. Laws and institutions which in any way interfered with his projects he either abolished or altered. In his zeal to do good he was too frequently injudicious in choosing times and seasons, and the least show of opposition irritated him into ferocity. He repudiated his wife a few years after marriage for her reactionary leanings; for the same reason his son Alexis was ill-treated, compelled to renounce the succession, and condemned to death, but died suddenly before sentence could be carried out. In 1707 Peter married his mistress Catherine; this marriage was publicly celebrated in 1712; Catherine was crowned in 1724, and succeeded the Tsar after his death.—Cf. K. Waliszewski, *Peter the Great.*

Peter II, Alexeievitsh, Tsar of Russia, grandson of Peter the Great and son of Alexis, ascended the throne in consequence of the will of Catherine I, in 1727, when but thirteen years old. He died in 1730 of the smallpox, and was succeeded by Anna Ivanovna.

Peter III, Feodorovitsh, Tsar of Russia, born 1728, was the son of Anna Petrovna, daughter of Peter the Great and the Duke of Holstein. Peter III ascended the throne in 1762, but on account of his German proclivities and other causes a conspiracy broke out on 8th July, 1762; he abdicated on the 10th, and was murdered on the 17th of the same month.

Peter I, Karageorgevitsh, king of the triune Kingdom of Yugo-Slavia (Serbs, Croats, and Slovenes), was born in 1844, the son of Alexander Karageorgevitsh and the grandson of Karageorge. He was educated at St. Cyr while an exile, and married Princess Zorka, the daughter of Nicholas of Montenegro, in 1883. In the early hours of the morning of the 11th June, 1903, King Alexander (Obrenovitsh) and Queen Draga of Serbia were brutally murdered in the royal palace at Belgrade, and the regicides, headed by Colonel Mashin, a brother-in-law of the murdered queen, formed a Provisional Government and proclaimed Prince Peter Karageorgevitsh King of Serbia. All the European Powers were represented at his coronation in Sept., 1904, excepting Great Britain, who did not resume diplomatic relations with the new monarchy until 1906. King Peter committed the regency of the kingdom to Prince Alexander, his second son, in June, 1914, but he remained with his armies during the European War, retiring to Greece, an exile, in 1916. On the formation of the triune kingdom he returned to Belgrade, and died there on 16th Aug., 1921.—Cf. R. Chambry, *Pierre I, Roi de Serbie.*

Peterborough, Charles Mordaunt, Earl of, born about 1658, died in 1735. He succeeded his father, Lord Mordaunt, 1675, and his uncle in the earldom of Peterborough (1697). William of Orange created him Earl of Monmouth, and appointed him First Commissioner of the Treasury for his services in connection with the dethronement of James II. He eminently distinguished himself in Spain as a commander in the Spanish Succession War (1705), especially by the capture of Barcelona, and received the thanks of the British Parliament. He also held several diplomatic posts; was created a Knight of the Garter (1713), and general of the British marine forces (1722).

Peterborough, an episcopal city and municipal borough of England, the latter partly in Huntingdonshire, the former in county Northampton, on the Nene; served by the Midland, Great Northern, Great Eastern, and London & North-Western Railways. It is an important railway and agricultural centre. The principal building is its cathedral (S. Peter), originally founded in 655, destroyed by the Danes in 870; rebuilt in 966, and again partly destroyed by fire in 1116. It has had its present form since early in the sixteenth century. The bishopric was founded by Henry VIII (1541), and his wife, Catharine of Aragon, was interred in the cathedral. Peterborough received a municipal charter in 1874. From 1547 to 1918 the city sent one member to Parliament. Pop. (1921), 35,533.

Peterborough, a city of Ontario, Canada, the county town of Peterborough county, on the Otonabee; served by the Canadian Pacific and by National (Grand Trunk) lines. There is also a local electric-traction system, hydro-electric power being derived from the five falls of the Otonabee, which have a total perpendicular drop of 50 feet. The Trent Canal gives entry to Lake Ontario. Machinery of all kinds is manufactured. Pop. 18,360.

Peterhead', a parliamentary burgh and seaport of Aberdeenshire, Scotland, on Peterhead Bay; served by the Great North of Scotland Railway. The town is built of red granite, obtained from quarries in the neighbourhood, and has a statue of Field-Marshal James Keith, presented by William I, Emperor of Germany. The town has a good trade, and is an important centre of the herring-fishery. Peterhead belongs to the Elgin group of parliamentary burghs. A national harbour of refuge was constructed between 1886 and 1921, mainly by convict labour. Pop. 13,126.

Peterhof, a town of Russia, 15 miles south-west of Petrograd, founded by Peter the Great in 1711. It is celebrated for its summer palace, in Versailles style, a favourite residence of the former Tsars of Russia. Pop. 16,000.

Peterhouse, or St. Peter's College, Cambridge, was founded in 1257 (charter 1284) by Hugh de Balsham, Bishop of Ely. Isaac Barrow, Archbishop Whitgift, Thomas Gray, and Lord

Kelvin were members of the college, which is the oldest college in the university.

Peterloo′ Massacre, the name popularly given to the dispersal of an open-air meeting of about 60,000 people, held on 16th July, 1819, in St. Peter's Field, Manchester, in favour of parliamentary reform. A number of persons were injured and eight killed. The word Peterloo is a burlesque of Waterloo.

Petersburg, a city and port of entry of Virginia, United States, at the head of navigation on the Appomattox River; served by the Seaboard Air-line; Norfolk & Western, and the Atlantic Coast-line Railways. Hydro-electric power is provided by falls above the city. Petersburg was originally built as Fort Henry, on the site of an Indian village (1645), and the town was founded in 1733 as Peter's Point. It became a city in 1850, and was besieged by the Federals under Grant (1864–5) as the 'last citadel of the Confederacy'. Pop. 30,000.

Petersfield, an urban district of Hampshire, England, with a fine Norman church of the twelfth century. It was a parliamentary borough from 1553 to 1885, returning two and afterwards one member to Parliament. Pop. 3900.

Peter's Pence, a papal tribute collected in several of the western countries of Europe. The idea of an annual tribute seems to have originated in England before the Norman Conquest, and was exacted from every householder of a certain standing about St. Peter's Day, originally for the support of an English college or hospice in Rome. Withheld by England in 1316, the tribute was finally abolished by Henry VIII. This contribution was sometimes also called *Rome-scot*. A free-will contribution called Peter's Pence is still collected among Roman Catholics, especially since the abolition of the Pope's temporal power.

Peterwardein, or **Petervarad**, a town of Yugo-Slavia, on the Danube, opposite Neusatz (Novisad), 45 miles north-west of Belgrade. Pop. 5000.

Pet′iole, in botany, a leaf-stalk; the stalk of a leaf, which connects the blade with the branch or stem. When the petiole is wanting, the leaf is said to be sessile. In general, however, it is distinctly marked, and is usually either round, or half-cylindrical and channelled on the upper side.

Petition (Lat. *petere*, to seek), a representation of grievances with an appeal for redress. The most important are petitions to Parliament. Since the Revolution of 1688 the subject's right to petition has been freely admitted. By the forms of the Houses of Parliament certain regulations must be complied with by petitioners, or their petitions will be rejected. A petition to the House of Lords must be addressed "To the Lords Spiritual and Temporal in Parliament assembled"; the form of address to the House of Commons is, "To the Honourable the Commons of the United Kingdom in Parliament assembled". The petition must begin, "The Humble Petition of . . . showeth"; if from an individual, it must state his name, address, and occupation. Immediately before the signatures the petition must close with the words "And your petitioners, as in duty bound, will ever pray". One signature at least must be on the same sheet or parchment as the petition. The signatures or marks of the petitioners must be made by themselves, not by agents, however deputed. A chairman cannot sign for a public meeting, but the common seal of the corporation is received for a corporate body. Petitions for the remission of customs or duties can only be presented with the consent of the Crown. The mode of obtaining redress for the improper election of a member of Parliament is by petition to two judges of the King's Bench Division of the High Court.

Petition of Right, in English history, a parliamentary declaration of the rights and liberties of the people, assented to by Charles I in the beginning of his reign (1628), and considered a constitutional document second in importance only to Magna Charta. The petition demanded: (1) that no freeman should be forced to pay any tax, loan, or benevolence, unless in accordance with an Act of Parliament; (2) that no freeman should be imprisoned contrary to the laws of the land; (3) that soldiers and sailors should not be billeted on private persons; (4) commissions to punish soldiers and sailors by martial law should be abolished.

Petöfi (pe-teu′fē), Sandor, Hungarian poet, born in 1823, died in 1849. In his youth he was for some time a common soldier and then a strolling player; in 1843 he contributed to the journals several poems which attracted instant attention; he also wrote several dramas and novels; his lyric of *Most vagy sohă* (Now or Never) became the war-song (1848) of the Revolution. In the Revolutionary War he was appointed an adjutant under Bem, and was killed in the battle of Schässburg. Petöfi was certainly the greatest literary genius of Hungary, and he may be considered as one of the greatest lyric poets of the nineteenth century. An English version of his poems was published in London in 1866 by Sir John Bowring.

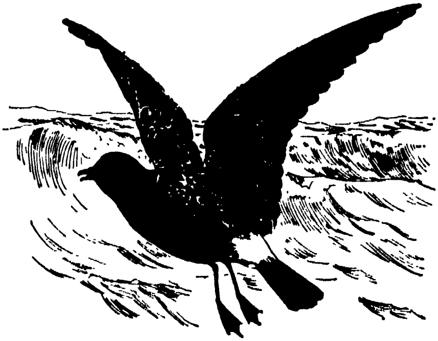
Petra (Gr. *petra*, rock), the name of several ancient towns, the most important of which are as follows. *Europe*.—(1) A city of Sicily, mentioned by Pliny and Ptolemy, which may be represented by the modern Petralia. (2) A fortress of Macedonia, which commanded a pass leading to Pythium, in Thessaly, by the back of Olympus. *Asia*.—(1) A town in the land of the

Lazi, in Colchis, founded by one of Justinian's generals to dominate the Lazi. It was destroyed by the Romans in A.D. 551, and the extant ruins are now called Oudjenar. (2) A mighty fortress of Sogdiana, attacked by Alexander and held by Arimazes. It is probably the modern Kohiten. (3) The most important Petra was the chief town of Arabia Petræa. It was the capital of the Idumæans and subsequently of the Nabatæi. The modern name is Wadi-Musa. Petra was situated in the eastern part of Arabia Petræa, in the district called, under the Christian emperors of Rome, Palæstina Tertia. Ancient geographers placed it in the northern district; modern ones place it in the southern portion, *Esh-Sherrah*, the Seir, or mountain land of the Old Testament (*Gen.* xxxvi, 8). The site is a wilderness overtopped by Mount Hor, and diversified by cliffs, ravines, plains, and watered valleys. The valley of Wadi-Musa was formerly the only roadway to Petra, and even now it is the principal one. Among the objects of interest, all hewn out of the living rock, are the amphitheatre of thirty-three tiers with accommodation for 3000 spectators, which is strangely surrounded by tombs; the rose-coloured *Khuzneh* with two rows of six columns over one another, with statues between, and with capitals and sculptured pediments, the upper one of which is divided by a little round temple surmounted by an urn. The Arabs believe that the urn contains a treasure, *Al-Khuzneh*, whence the name. There are also the remains of a *Deir* or cloister, and of thousands of rock-tombs.

Petra was successively in the hands of the Judæans, Nabatæans, and Macedonians. In A.D. 105 A. Cornelius Palma subdued the city for Trajan, and under Roman rule many of the finest tombs, &c., were erected. Frequently prophesied in Scripture, the destruction of Petra was accomplished by the Mahommedans (seventh century A.D.), and the site was for long unknown. It was discovered by Burckhardt.

Petrarch (pet′rärk), Francesco Petrarca, an Italian poet and humanist, born at Arezzo 20th July, 1304, died 18th July, 1374. His father being an exile from Florence, his earliest years were spent at Incisa, in the vale of Arno, and afterwards with his father at Carpentras, near Avignon, where he began his education. He afterwards studied law at Montpellier and Bologna, but his own inclinations led him to devote his time to Latin and the Provençal poets. It was at Avignon in 1327 that he first saw, in the church of St. Claire, the Laura who exercised so great an influence on his life and lyrics. It is supposed that her name was Laura de Noves, that she had become the wife of Hughes de Sade two years before she was seen by Petrarch, and that she died in 1348 a virtuous wife and the mother of a large family. After this first meeting Petrarch remained at Avignon three years, singing his purely Platonic love, and haunting Laura at church and in her walks. He then left Avignon for Lombez (French department of Gers), where he held a canonry gifted by Pope Benedict XII, and afterwards visited Paris, Brabant, Ghent, the Rhine, &c. In 1337 he returned to Avignon, bought a small estate at Vaucluse, in order to be near Laura, and here for three years wrote numerous sonnets in her praise. It was upon his Latin scholarship, however, that he rested his hopes of fame. His Latin works were highly esteemed, and in 1341 he was called to Rome to receive the laureate crown awarded for his Latin poem of *Africa*, an epic on the Punic wars. In his travels Petrarch made valuable discoveries, which have placed him high among the restorers of letters. He had advanced views for his age on history and science, despising legends and astrology, and recommending true research. In politics his views were equally advanced, and while he severely criticized the vices of the clergy, he had no sympathy with the scepticism which was common among the scholars of the day. At Parma he learned the death of Laura, which he recorded on his copy of Virgil, and celebrated in his *Trionfi*. A large part of his time was employed in various diplomatic missions, and in 1370 he took up his residence at Arqua, near Padua, where he passed his remaining years in religious exercises. Among his Latin works are three books of letters (*Epistolæ Familiares*) and twelve *Eclogues*, his poem *Africa*, and various philosophical, religious, political, and historical treatises. Petrarch's fame, however, is based upon his Italian verse, which consists chiefly of the *Trionfi* and the *Canzoniere*. The first is allegorical and moral in its nature, whilst in the latter the love motive is paramount, although many of the sonnets are pervaded by moral and patriotic feelings. The majority of the sonnets are in praise of golden-haired Laura, living or dead, but numerous sonnets breathe the passion of patriotism. Lamartine and other critics looked upon Petrarch as 'the most accomplished of the poets of sentiment', whilst Renan styled him "le premier homme moderne". Educated in the school of the ancients, he declared war on the scholasticism of his age. The spiritual and intellectual descendant of Greece, he became the father of the new learning of the Renaissance. He was the pioneer of humanism (q.v.), and the first of modern poets who refined and dignified the language of love. He was at once a pagan filled with the sense of beauty, and a Christian imbued with the ideals of asceticism and mysticism.—Bibliography: H. C. Hollway-Calthrop, *Petrarch: his Life and Times*; M. F. Jerrold, *Francesco Petrarca, Poet and Humanist*; P. Borghesi, *Petrarch and his Influence on English Literature*; P. de Nolhac, *Pétrarque et l'Humanisme*; A. J. F. Mézières, *Pétrarque: étude d'après de nouveaux documents*.

Petrel, the common name of web-footed oceanic birds of the family Procellariidæ. The petrels are nocturnal in their habits, breed in holes in the rocks, lay but one egg, and are almost all of small size and more or less sombre plumage. The smaller species are well known to sailors under the name of 'Mother Carey's chickens', and their appearance is supposed to presage a storm. The term stormy petrel is more exclusively applied to the *Procellaria pelagica*, a bird which seems to run in a remarkable manner along the surface of the sea, where it picks up its food.



Stormy Petrel (*Procellaria pelagica*)

Petrie, William Matthew Flinders, Egyptologist, was born in 1853, and educated privately. During the five years 1875–80 he carried out investigations in British archæology, the results being published in the works *Inductive Metrology* (1877), and *Stonehenge: Plans, Description, and Theories* (1880). Proceeding to Egypt, he made a careful survey in 1881–2 of the Pyramids of Gizeh, and in 1884–6 continued his work under the auspices of the Egypt Exploration Fund Committee. He excavated the site of Tanis, and discovered and excavated Naukratis, Am, and Daphnæ. Among his publications are: *A Season in Egypt* (1888), *Historical Scarabs* (1889), *Ten Years' Digging in Egypt* (1893), *History of Egypt* (1894–1905), *Egyptian Tales*, *Decorative Art* (1895), *Religion and Conscience in Ancient Egypt* (1898), *Syria and Egypt* (1898), *Methods and Aims in Archæology* (1904), *Revolutions of Civilization* (1911), *Eastern Exploration* (1919), *Some Sources of Human History* (1919), and *Prehistoric Egypt* (1920).

Petrobru'sians, the followers of *Peter* (Pierre) de *Bruys*, a Provençal, who in the beginning of the twelfth century preached against the doctrine of baptismal regeneration, the use of churches, altars, crucifixes, relics, &c., prayers for the dead, and the doctrine of the real presence.

Petrograd, formerly **St. Petersburg**, the former capital of the Russian Empire, built at the head of the Gulf of Finland and at the mouth of the Neva, the larger portion being on the south or left bank of the river; a small portion on the north bank; and the remainder on the islands of the Neva delta (about 100 in number), these various sections being connected by numerous bridges. In point of size it is the fifth city of Europe. The site is low and marshy, and liable to periodic inundations; it is also unhealthy, the death-rate largely exceeding the birth-rate. The Neva is frozen, on an average, during five months of the year, usually between the end of November and the end of April, but navigation is maintained by the aid of ice-breakers. Petrograd is connected by the Arctic Railway with the Murman coast at Alexandrovsk. The most important quarter is on the south side of the Neva, and is intersected by three main streets which radiate from the Admiralty on the river bank. These are called the Nevski Prospekt, a magnificent street, nearly 3 miles long and 130 feet wide, the Gorokhovaya, and the Prospekt Voznesenski. Near the Admiralty are the chief public buildings of the city. The principal churches (which are generally distinguished by prominent cupolas) are St. Isaac's Cathedral, built of granite and Finland marble, and with a profusely decorated interior; the cathedral of St. Peter and St. Paul, the resting-place of the Romanov emperors (excepting Peter II and Nicholas II), with a conspicuous pyramidal spire (302 feet); the cathedral of Our Lady of Kazan, a cheap copy of St. Peter's in Rome, very badly executed, and one of the ugliest cathedrals of Russia; the Smolni Cathedral; and the Memorial Church, built on the spot where Tsar Alexander II was assassinated, one of the most splendid of the many sacred edifices in the city. Among the many palaces are the Winter Palace; the old Michael Palace; the new Michael Palace, one of the chief ornaments of the city; and the Hermitage Palace, containing a fine library and one of the richest collections of French, Flemish, Dutch, Italian, Spanish, Russian, and other paintings, formerly the private property of the Tsars, besides engravings, coins, gems, antiquities, &c. The cottage in which Peter the Great lived while superintending the construction of St. Petersburg is still preserved. Other buildings of importance are: the Admiralty, a vast parallelogram of brick, with a naval and natural history museum and library; the arsenal, containing a museum of artillery; the fortress of Petropavlovsk (the Russian Bastille); the Academy of

Sciences, with extensive museum and library; and the old imperial library, with over a million volumes and large collections of manuscripts and engravings. There are numerous hospitals and charitable institutions, a university, founded in 1819, many special academies, and four theatres. St. Petersburg formerly commanded a large share of the commerce of the whole empire, ranking second to Moscow in this respect. The chief exports are timber, eggs, wheat, rye, oats, wheat-bran, mineral oil, oil-cake, and mats; the chief imports are coal, coke, patent fuel, metals, raw cotton, tea, herrings, and machinery. Formerly the port of the capital was at the strongly fortified island town of Kronstadt, but vessels are enabled to reach the commodious harbours of Petrograd by means of a ship-canal 18 miles long and 22 to 23 feet deep.

St. Petersburg was founded by Peter the Great in 1703, when he had just wrested its site from the Swedes. The forced construction of a city on a site apparently forbidden by nature cost the lives, according to various accounts, of from 100,000 to 200,000 peasants, collected from all parts of the Russian Empire. It was at first built entirely of wood, and without a proper street system, but the extensive fires of 1736 and 1737 facilitated the reconstruction on an improved plan. The Empress Elizabeth did much to improve the city; it was, however, chiefly indebted to Catherine II for its regularity and architectural splendour; and the improvements under Nicholas and Alexander II made it one of the finest of European capitals. Its commercial prosperity was due to the centralization of an autocratic government, but the main motive for the transference of the capital had ceased to exist for many years through the relief of Moscow from isolation by its connection with the State railway systems, and the restoration of Moscow to its position as capital was repeatedly considered in days before the European War. Petrograd was the storm-centre of the Russian Revolution (12th March, 1917), and within the city the Republic was proclaimed (Sept., 1917). In November the Soviets occupied the Smolni Institute as head-quarters, and on 14th March, 1918, they transferred the capital to Moscow. Reactionaries several times advanced upon the city, and an outbreak in March, 1921, was supported by many of the Kronstadt garrison. Subsequent to and as a direct consequence of the transfer of the capital, Petrograd was very much neglected, the principal buildings assumed an air of dejected dilapidation, and a report was circulated to the effect that Herr Hugo Stinnes had contracted to restore it architecturally to some semblance of its pristine grandeur (1922). Pop. (1913), 2,318,645; (1919), about 1,121,000.—Cf. W. B. Steveni, *Petrograd, Past and Present.*

Petrol. See *Petroleum.*

Petro'leum, or mineral oil, is natural oil consisting almost entirely of hydrocarbons. It is obtained from the earth's crust in two ways, namely by means of oil-borings or oil-wells, and by the distillation of oil-bearing rocks or oil-shale (see *Paraffin*). Although the fire-worshippers, as early as 600 B.C., were attracted by the 'eternal fires' to Baku, on the Caspian Sea, where inflammable gases issued from the ground, the idea of utilizing the oil to any extent for practical purposes is little more than a century old. The oil industry can be said to have started in Russia in 1818, in the United States in 1859, and in Galicia and Roumania modern methods of boring were introduced in 1881. The oil-shale industry began in Scotland in 1850. Geologically the world's oil-fields may be divided into two groups, namely those occurring in Palæozoic strata, as in Pennsylvania, and those occurring in Upper Cretaceous and Tertiary strata, as in California, the Caucasus, Galicia, Roumania, Burmah, and the Dutch East Indies. The oil usually occurs in beds of a sandy or porous nature which are overlain by clay or impervious beds. It is perhaps surprising that oil is very rarely found to occur in conjunction with coal. The oil-shales of Scotland belong to the Lower Carboniferous series, and those found in the United States to the Devonian series. In prospecting for oil the most important considerations, apart from knowledge given by the geological survey, are surface indications, such as oil-springs and emanations of natural gas. Boring for oil is carried out either by the percussion method or the rotary method. In the former a steel boring-tool is alternately raised and allowed to fall, and before each fall it is turned through a small angle. In this way a circular hole is gradually chipped out. The fragments of rock are removed from the hole from time to time by means of a pump. The rotary method makes use of a hollow, cylindrical tool, the lower edge of which is provided with teeth like a saw or with diamonds. It is kept cool by a stream of water. By this means a core of rock is cut out. The diameter of the hole made by either method is about 18 inches at the surface, and is gradually decreased the greater the depth. Many difficulties are encountered, such as the falling in of the sides in soft strata, and the occurrence of water under great pressure at various depths. These difficulties are overcome by lining the hole with steel tubes. It often occurs when the oil-bearing rock is first pierced that the oil rushes up the bore-hole with great violence, producing a fountain of oil. The classical example of this is the great Droojba

Well in the Baku district, which in 1883 spouted for four months to a height of from 100 to 300 feet, and as a result about 100 million gallons of oil ran to waste. Even if spouting occurs it does not usually last long, and then recourse is made to forcing the oil up by compressed air. In some cases the difficulty of this operation is increased by the viscosity of the petroleum, as in the Burmah oil-fields. The oil is conveyed to the refineries, which are usually many miles distant, by means of tank railway cars, oil barges, or pipe lines. Pipe lines sometimes run several hundred miles, and are divided into sections of 40 or 50 miles. At the end of each section the oil is delivered into tanks and then pumped along the next section, as it is not possible to force the oil farther than this. The output of crude petroleum from the chief oil-fields in 1920, expressed in millions of tons, was as follows: United States, 61; Mexico, 24; Russia, 3·4; Dutch East Indies, 2·3; Persia, 1·7; India, 1·0; Roumania, 1·0. The output from oil-shales, which are mined in the same way as coal and then distilled, is relatively insignificant. The yield of oil from the Scottish shales in 1910 was 273,000 tons.

Crude petroleum is a dark-brown liquid possessing a disagreeable smell. It is slightly lighter than water, its specific gravity usually being between 0·94 and 0·98. Crude petroleum is a mixture of a large number of substances, mostly compounds of carbon and hydrogen. It consists chiefly of hydrocarbons of the paraffin series (see *Paraffin*). Russian petroleum contains a large proportion of another series of hydrocarbons called naphthenes, which are very similar in their properties to the paraffins. The composition of the petroleum found in Borneo is unusual, as it includes a large quantity of hydrocarbons of the benzene series, such as benzene, toluene, and xylene. Burmah petroleum contains a large proportion of the higher members of the paraffin series; hence its greater viscosity. In addition to these important constituents, petroleum contains minute quantities of compounds containing nitrogen and sulphur.

Refining.—Crude petroleum is not very suitable for direct practical application, and it is therefore refined or separated into a number of different fractions, each fraction consisting of a limited number of hydrocarbons and having its special commercial use. The crude oil is distilled from vessels holding about 50,000 gallons, and the distillate is collected in several different fractions. These fractions are then further subdivided by fractional distillation into products ready for commercial use. The first fraction collected is the oil, which distils over up to a temperature of about 80° C., and it consists chiefly of the fifth and sixth members of the paraffin series, namely pentane and hexane. The fraction yields light and easily volatile oils, which on account of their volatility catch fire very readily, and are therefore to be used with considerable caution. They are known commercially by names such as gasoline, rhigolene, and petroleum ether, and they find application in industry as solvents for oils, fats, resins, and rubber; in surgery for producing local insensibility by freezing; and to produce air-gas for lighting country houses.

The second fraction is collected up to about 150° C., and yields principally petrol or motor spirit, which is sometimes called benzine. This latter is a confusing term, as petrol is quite different from coal-tar benzene, and rarely contains hydrocarbons of the benzene series. It consists principally of heptane, octane, and nonane. The chief use of petrol is as a source of power in internal-combustion engines. Used in this way, 1 lb. of petrol will generate as much mechanical energy as every 8½ lb. of coal used in a good steam plant. Petrol is therefore a more economical source of energy than coal. Another use of petrol is for carburetting coal-gas, i.e. rendering it sufficiently luminous when burned in a naked flame. A third use of petrol is for dry-cleaning purposes.

The third fraction is collected between 150° C. and 300° C., and consists of a mixture of all the members of the paraffin series from decane to octadecane. It furnishes oils used for illuminating purposes, known as paraffin oil, mineral colza, and kerosene. The fraction is purified chemically by being treated first with concentrated sulphuric acid and then with soda lye. It is then redistilled into illuminating oils of different grades.

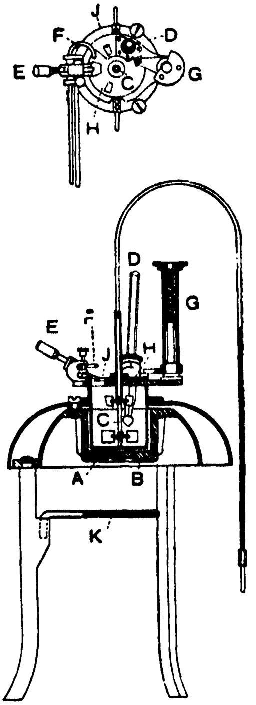
The fourth part or fraction is the residue left in the still after the boiling temperature has reached 300° C. This fraction consists of the higher members of the paraffin series, and furnishes such products as lubricating oil, other heavy oils used as fuels, vaseline, and solid paraffin or paraffin-wax (see *Paraffin*). The heavy fuel oils are used in internal-combustion engines, such as the Diesel engine. Being much less volatile than petrol, they cannot be vaporized in a carburettor at ordinary temperatures. Pre-heating is necessary to vaporize the oil, and so produce the necessary explosion mixture of oil and air. These oils are also used in locomotives, steamers, and in stationary power plants for steam raising instead of coal. The oil is burned with the aid of an atomizer, a contrivance which distributes it in the form of a fine spray. This spray, when mixed with a suitably adjusted draught of air, burns with a practically smokeless and very hot flame. Oil as a fuel for steam raising possesses several advantages over coal. It contains practically no incombustible matter, whereas coal leaves a considerable quantity of ash after burning. Again, it occupies less space than coal, and is much more easily handled, both of which considerations are of great importance in refilling the bunkers with fuel. Lastly, 1 ton of oil will raise as much steam as 1½ tons of coal.

Vaseline is a semi-solid substance used as an ointment and for protecting metals from corrosion or rust.

Natural Gas.—Another product of oil-wells, besides the crude petroleum, which has practical application is natural gas. This almost always occurs associated with oil-borings, and consists largely of the first member of the paraffin series, namely methane or marsh gas. It also contains some of the olefine series of hydrocarbons, such as ethylene. For many years it was allowed to escape and thus was wasted, but now it is collected and used for the lighting of towns and as a source of heat. In the United States in 1919, 735,000 million cubic feet were consumed.

Origin of Petroleum.—Various theories have been put forward to account for the formation of petroleum. Some of these assert that the oil is of inorganic origin, attributing its formation to purely chemical processes taking place within the earth; whilst others favour the idea of an organic origin, which undoubtedly applies to the formation of coal. The chief supporter of the inorganic theory was Mendeléev. He assumed that in regions of high temperature at a considerable distance below the surface of the earth large quantities of carbides of heavy metals, such as iron and manganese, occur. During times of considerable upheaval in the history of the earth cracks may have formed in its crust, allowing the surface waters to descend and come in contact with the carbides.

The action of water on metallic carbides is to form hydrocarbons and oxides of the metals. The hydrocarbons formed will be driven by the intense heat into cooler regions, where they will condense and collect. The fact that large supplies of oil are derived from Palæozoic strata which contain organic or fossil remains in insignificant quantities is in support of the inorganic theory. An alternative inorganic theory has been proposed by Sabatier. He assumes the presence of the alkali metals, sodium and potassium, in addition to the carbides of the heavy metals. The action of water on the alkali metals produces hydrogen, and on the carbides produces hydrocarbons, such as acetylene. The hydrogen and acetylene then combine, under the catalytic influence of the metals, nickel, iron, and others, to form a mixture of hydrocarbons. The organic theory suggests that oil is the product of accumulations of decaying organic matter, both vegetable and animal, which have subsequently been overlain and subjected to heating. That oils similar to natural petroleum are produced by heating organic matter is proved by the distillation of coal. Neither of these theories is wholly satisfactory, and it is possible that petroleum arises from both organic and inorganic sources. On the other hand, there is little doubt that the oil of oil-shales is, like coal, of organic origin.



Pensky-Martin's Flash-point Apparatus

A, Oil-cup. B, Heating vessel. C, Stirrer. D, Thermometer. E, Ignition burner. F, Pilot burner. G, Spring handle. H, Revolving shutter. J, Orifice. K, Gauze disc.

Petroleum as a Source of Energy.—Next to coal, petroleum is the greatest natural source of energy at present available. A number of estimates have been made of the duration of the world's supply, which vary from 100 to 1000 years. The output of oil has increased in greater proportion than the number of wells; but the oil-shales form a more permanent supply, those of Scotland and Australia yielding an oil which even now competes in price with petroleum from wells. The Devonian shales of the United States are much poorer in oil, but a considerable rise in the price of oil from other sources would enable them to be worked economically, and they extend over many thousands of square miles. It is probable, however, that the supply of oil will be exhausted before the supply of coal.

Flash-point.—The flash-point of an oil is the lowest temperature at which the vapour which it gives off forms an inflammable mixture with the air immediately above the oil.

Very volatile oils, such as the motor spirits, petrol, benzol, and alcohol, possess a high vapour pressure, and flash at temperatures well below the freezing-point of water. They must therefore be handled at a safe distance from a flame and stored under special conditions. Light oils which have a closed flash-point of less than 78° F. are also subject to special restrictions as regards handling and transport in Great Britain.

The flash-point throws no light on the quality of an oil either for fuel or for lubrication, though it does give some idea of its composition. It can be stated, however, that a light oil cannot be successfully used as a motor spirit in the ordinary way unless its flash-point is very low.

To obtain comparable and concordant results it is necessary to carry out the test under specified conditions with regard to size of vessel, quantity of oil, speed of heating, size of ignition flame, frequency of injection of flame, and rate of stirring, and standard apparatus must be used.

Another point to be carefully distinguished from the flash-point is the *ignition temperature*, that is, the temperature at which the oil will spontaneously ignite without flame contact. This test is generally carried out in a platinum crucible placed in a block of steel heated by a Bunsen burner. When the ignition-point is reached, a drop of the oil allowed to fall into the crucible will inflame, causing a mild explosion.

The following is a list of flash-points of petroleum and other oils.

Motor spirit	below 30° F.
Crude petroleum	30° to 300° F.
Paraffin-oil	100° to 200° F.
Crude coal-tar	100° to 190° F.
Fuel oils	140° F. upwards.
Spindle oils	320° to 390° F.
Cylinder oils	360° to 540° F.
Castor-oil	527° F.
Linseed-oil	545° F.
Rape-oil (refined)	580° F.

See *Fuel*; *Thermal Value of Fuels*.

BIBLIOGRAPHY: J. A. Greene, *A Treatise on British Mineral Oil*; Sir Boverton Redwood, *A Treatise on Petroleum*; H. Moore, *Liquid Fuels for Internal Combustion Engines*; J. S. S. Brame, *Fuel: Solid, Liquid, and Gaseous*; V. B. Lewes, *Liquid and Gaseous Fuels*.

Petrol′ogy, the science dealing with rocks, formerly regarded as a branch of mineralogy, but now fundamental among the studies required of the trained geologist. The principles and the growth of petrology are treated in the article on *Geology*. *Petrography* is strictly the description of rocks; but the term is often used as synonymous with petrology, since all description must be founded on systematic studies.

Petronius, Gaius (usually surnamed **Arbiter**), Latin novelist, author of the *Satiricon*. Most competent authorities agree in identifying the author of the earliest novel with the Petronius who lived in the reign of Nero, and who is described by Tacitus in the sixteenth book of the *Annals*. Tacitus tells us that Petronius passed his days in sleep and his nights in business and pleasure; he was an epicure, not a prodigal; he was a refined and cultivated voluptuary. He won the title of *elegantiæ arbiter* at Nero's court, and was "the glass of fashion and the mould of form". He incurred the jealousy of Tigellinus, and was compelled to commit suicide, which he did in characteristic fashion by having his veins opened and tied up, while he listened to the recitation of light verse. Finally he sent to Nero a list of the emperor's abominations and the names of his partners in vice.

The theory that in the *Satiricon* we have Petronius's dying message to Nero is German in its origin, and has absolutely nothing to recommend it. It is impossible to believe that a dying man could write a novel as long as *Tom Jones*, for the very considerable fragments of the work which we possess are merely excerpts from the fifteenth and sixteenth books, and the whole novel must have been extremely long. This theory has misled some scholars into identifying some of the characters with real persons. Another theory is that the *Satiricon* is a kind of comic epic, a burlesque on Homer, the wrath of Priapus, on account of Encolpius, the hero, killing the sacred goose, taking the place of the wrath of Achilles. This theory is not at all probable; nor is any theory tenable which attributes a purpose or a definite plan to this remarkable novel. Petronius followed his own whim, though in describing the vices of low life he may have desired to glorify the more refined vices of the court.

In form the *Satiricon* is a Menippean satire, that is to say, a mixture of prose and verse. It deals with the adventures of two Greek rogues, Encolpius and Ascyltos, and their boy Giton. Eumolpus, an old inveterate poet, is another principal character. The scene of the novel is varied; the main incidents seem to have taken place at Cumæ, other incidents took place on board ship, and others at Croton. Some of the lost books seem to have had their scene laid at Marseilles.

By far the longest as well as the most interesting fragment which we possess is the famous Dinner of Trimalchio. This fragment was only found in its entirety in 1663. It is of the utmost importance, both for the subtlety of its character delineation and for the light it throws on manners and customs. Trimalchio, the self-made man, is faithfully depicted, as are the freedmen with their commonplace and tedious table-talk. Interesting stories of were-wolves and witches are told. Other noteworthy passages in the novel are those which deal with the decadence of art and letters, with education, and with the legacy-hunters of Croton. Two long poems are embedded in the novel, one apparently a sort of skit on Nero's poem on the fall of Troy, and the other an attempt to show how Lucan should have written the *Pharsalia*.

Petronius was a great stylist and critic; his Latin, when not purposely debased (as it is in the talk of some of the uneducated characters), is the best Latin of the Silver Age, and his remarks on art and literature are penetrating and illuminating. But it is as the earliest novelist that he is chiefly remembered. His novel is original and unique. In the vitality of his characters and in subtle humour it is not too much to say that he is almost Shakespearean. —BIBLIOGRAPHY: W. D. Lowe, *Cena Trimalchionis* (text, notes, and translation); Michael Heseltine, *Petronius* (text and translation, Loeb Library); Collignon, *Étude sur Pétrone*; Sir Samuel Dill, *Roman Society from Nero to Marcus Aurelius*.

Petropavlovsk′, a town of the government of Akmolinsk, Asiatic Russia, on the Ishim; served by the Siberian Railway. It has soap and leather manufactures, and trades in cereals, wool, and cloth. Pop. about 25,000.

Petrop′olis, a town and health-resort of Brazil, in the state of Rio de Janeiro. It was founded in 1845 by German colonists, and was state capital from 1893 until 1903. Pop. 30,000–40,000.

Petrovsk′, a town of Russia, in the government of Saratov; served by the Atkarsk-Volsk Railway. It was founded in 1698 by Peter the Great. Pop. 18,000.

Petrozavodsk′, a town in Russia, capital of the government of Olonetz, on Lake Onega, Petrograd. It has an iron-foundry, founded by Peter the Great in 1703, and a cannon-foundry, established in 1774. Pop. 15,000.

Pettichaps, or **Pettychaps**, a casual name for the garden warbler (*Sylvia horticola*).

Pettie, John, Scottish painter, born at Edinburgh in 1839, died in 1893. He studied at the Royal Scottish Academy; exhibited *The Prison Pet* (1859) at Edinburgh, and began in the following year to exhibit in London. Remarkable alike for vigorous conception and technical dexterity, his historical and genre paintings have been numerous. Of these may be mentioned: *What d'ye lack, Madam* (1861); *The Drum-head Court Martial* (1864); *Arrest for Witchcraft* (1866); *Disgrace of Wolsey* (1869); *Scene in the Temple Gardens* (1871); *Juliet and Friar Laurence* (1874); *Sword and Dagger Fight* (1877); *Challenged* (1885); *The Chieftain's Candlesticks* (1886); *Two Strings to her Bow* (1887); and *The Traitor* (1888).

Petty, Sir William, English statistician and economist, born at Romsey, Hampshire, 1623, died 1687. He was educated in his native town and in Normandy; served for a time in the navy; studied medicine at Utrecht, Leyden, and Paris; came to Oxford, and was (1649) elected a Fellow of Brasenose; became professor of anatomy (1651); and in the following year joined the army in Ireland as a physician. Here he was appointed surveyor of the forfeited Irish estates (1654), and produced the Down Survey of Irish Lands. He became secretary to Henry Cromwell, the Lord-Lieutenant; and in 1658 entered Parliament. He wrote a *Treatise of Taxes and Contributions*.

Petty Officer, a rating in the Royal Navy, equivalent in rank to a sergeant or staff-sergeant of the Royal Army or Royal Marines, according to seniority. The distinguishing badge of a petty officer is the crossed hooks surmounted by a crown, worn in red or gold, according to dress, on the left arm. All petty officers are now ranked as ' first-class ', but formerly there were two divisions, a ' first-class ' and a ' second-class '. The second of these was distinguished by a single hook identical with that worn by a leading seaman, but surmounted by a crown, and the rating was equivalent to that of lance- or full sergeant in the Royal Army or Royal Marines. A few such ' second-class rates ' existed in the early days of the European War, but are now extinct. As in the case of officers, there are two branches, administrative and executive, the latter (seamen and stokers) being distinguished from clerks, &c., by the form of dress, which, but for the badges, is identical with that of the ordinary seaman. Chief petty officers, equivalent to company sergeant-majors in the Royal Army, wear ' square rig ', i.e. collar and tie, qualification badges (seaman-gunner, &c.) being worn on the jacket lapel. In the case of stokers there are chief stokers and mechanicians, the latter being senior. Chief writers, chief cooks, and chief signalmen (or yeomen of signals), &c., all wear square rig, and are distinguished by their collar badges.

Petu′nia, a genus of American herbaceous plants, nat. ord. Solanaceæ, nearly allied to tobacco. They are much prized by horticulturists for the beauty of their flowers.

Petworth-marble, also called *Sussex-marble*, from being worked at Petworth, in Sussex, a variously coloured limestone occurring in the Weald clay, and composed of the remains of freshwater shells.

Peutingerian Table, a table of the roads of the ancient Roman world, written on parchment, and found in 1507 by Conrad Celtes in the library of the Benedictine monastery at Tegernsee, in Bavaria. The document was so named from Conrad *Peutinger*, a native of Augsburg, who was the first to make it generally known. The document traces roads through India to numerous trade-places as far as the mouth of the Ganges. It is supposed to have been constructed about A.D. 226.

Pewter, an alloy of tin and lead, or of tin with proportions of lead, zinc, bismuth, antimony, or copper, and used for domestic utensils. One of the finest sorts of pewter is composed of 100 parts of tin to 17 parts of antimony, while the common pewter of which beer-mugs and other vessels are made consists of 4 parts of tin and 1 of lead. The kind of pewter of which tea-pots are made (called Britannia-metal) is an alloy of tin, brass, antimony, and bismuth.

Peyer's Glands, in anatomy, the clustered masses of lymphoid tissue in the walls of the ileum (small intestine), first discovered by a Swiss anatomist named Peyer. See *Intestine.*

Pézenas (pā-zé-näs, Gallic *Piscennæ*), a town of France, in the department of Hérault, on the left bank of the Hérault, at the confluence of the Peine, 25 miles w.s.w. of Montpellier. It has a trade in spirits and wine. At Pézenas Molière wrote his comedy *Les Précieuses ridicules.* Pop. 7000.

Peziza, an extensive genus of Ascomycetous Fungi, group Discomycetes, saprophytes growing on soil, dead twigs, &c. Most have large, fleshy, often brightly coloured apothecia, *P. aurantia*, of a brilliant orange colour, and *P.* (*sarcoscypha*) *coccinea*, with cups of a deep crimson hue, being particularly handsome species.

Pfennig, a small copper or rather bronze coin current in Germany, of which 100 = 1 mark; so that 10 pfennige were worth before the European War a little over an English penny. After 1915 iron, aluminium, and zinc pieces were coined.

Pforzheim (pforts'hīm), a town and railway junction of Baden, Germany, on the northern edge of the Black Forest, at the junction of the Nagold with the Enz. The chief industries are in the making of gold and silver trinkets, machinery, castings, tools, chemicals, leather, paper, cloth, and beer. Pforzheim was settled by the Romans. Pop. 70,000.

Phacochere (fă'ko-kēr), or **Phacochœre**, the wart-hog of Africa, genus Phacochœrus, akin to the swine, characterized by a large wart-like excrescence on each side of the face. The tusks of the male project 8 or 9 inches beyond the lips, and form terrible weapons. There are two species, *P. æthiopicus* and *P. africanus.*

Pha'cops, See *Trilobites.*

Phædo, a Greek philosopher. Born in Elis, he came to Athens about 400 B.C., where he became acquainted with Socrates and one of his most devoted disciples. After the death of his master he returned to his native town and founded a Socratic school of philosophy. Plato's dialogue on the immortality of the soul bears the name of *Phædo.*

Phædra, in Greek legend, daughter of Minos, King of Crete, and of Pasiphaë, sister of Ariadne and wife of Theseus. She falsely accused her stepson, Hippolytus, of attempting to seduce her, an injustice of which she afterwards repented, and was either killed by her husband or committed suicide. Sophocles wrote a *Phædra* which is lost; and the story is the subject of Euripides's extant play the *Hippolytus.* The Euripidean tragedy was imitated by Seneca in his *Phædra*, and by Racine in his masterpiece *Phèdre.*

Phædrus, a Latin fabulist of the Augustan age, who translated and imitated the fables of Æsop. He was a Thracian slave brought to Rome, and manumitted by Augustus. Some authorities have doubted the genuineness of the fables ascribed to Phædrus, but their style is favourable to the supposition of their genuineness. There are five books containing ninety-seven fables attributed to him, besides certain others. In the prologue to the first book Phædrus declares his work to be a free translation of Æsop, but in subsequent books he hints at having taken greater liberties with his subject, and introduced fables of his own under the name of Æsop.

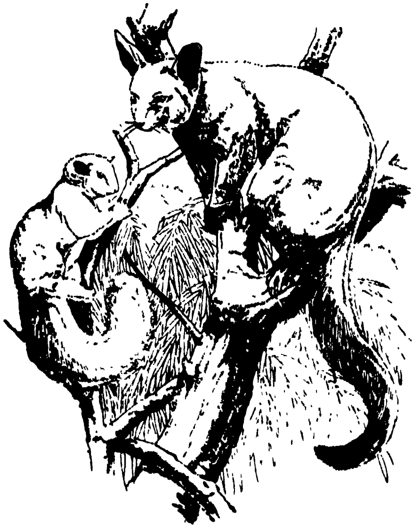
Phæophyceæ. See *Brown Algæ.*

Pha'ĕthŏn, in Greek mythology, the son of Helios (the sun). One day he obtained leave from his father to drive the chariot of the sun, but being unable to restrain the horses Zeus struck him with a thunderbolt and hurled him headlong into the River Po. His sisters found him there, and lamented for him. They were changed into poplars, and their tears into amber.

Phagedena is a form of spreading sloughing ulceration, usually seen in association with venereal disease, and occurring in unhealthy people. Unless treated, it spreads extensively, and causes much loss of tissue.

Phagocytes are those cells of the body, chiefly the white blood corpuscles (leucocytes), capable of absorbing bacteria—a process known as phagocytosis, first brought forward by Metshnikov to explain the facts of immunity. After observation he came to the conclusion that successful resistance of an animal (or man) to disease depended on the activity of certain cells, called phagocytes; and insusceptibility to a disease was indicated by rapid action on the part of the phagocytes in destroying the bacteria and preventing even local damage. In moderately susceptible cases there occurs a local inflammation, due to the increase of blood-cells (phagocytes) brought to envelop and finally destroy the invading organisms, and, on the other hand, in highly susceptible cases phagocytosis did not occur or was only imperfect. His theory is now largely accepted as a rational explanation of the action of blood-cells on bacteria.

Phal'anger, the name given to the members of a family of marsupial mammals inhabiting Australasia. They are generally of the size of a cat, are nocturnal in their habits, and live in trees, feeding on insects, fruits, and leaves. The vulpine phalanger or vulpine opossum is a common type. See also *Flying Phalanger.*



Phalangers

Left—Squirrel Flying Phalanger (*Petaurus sciureus*). Right—Vulpine Phalanger (*Trichosurus vulpecula*)

Phalan'ges (-jēz), the name applied to the separate bones of which the digits (or fingers and toes) of vertebrates are composed. Each digit or finger of the human hand consists of three phalanges, with the exception of the pollex or thumb, which is composed of two only.

Phal'anx, a name given generally by the Greeks to the whole of the heavy-armed infantry of an army, but more specifically to each of the grand divisions of that class of troops when formed in ranks and files close and deep, with their shields joined and their pikes crossing each other. The Spartan phalanx was commonly eight men deep, while the Theban phalanx was much deeper.

Phal'aris, a tyrant of Agrigentum, in Sicily (probably between 571 and 549 B.C.), chiefly celebrated in tradition for his cruelty. He is said to have burned his victims in a brazen bull, within which a slow fire was kindled. By means of pipes fitted in its nostrils the shrieks of the tyrant's victims became like the bellowing of the animal. He was represented in later times as a patron of literature and quite a humane man. The letters of Phalaris, of which an English edition was published in 1695, were shown to be spurious by Richard Bentley in his *Dissertation on Phalaris* (1699).

Phal'aris, a small genus of grasses, of which the seed of one of the species, *P. canariensis*, or canary-grass, is extensively employed as food for birds, and commonly known as canary-seed.

Phalarope (fal'a-rŏp), the common name of several grallatorial birds forming the genus Phalarŏpus. The grey phalarope (*P. lobătus*), frequently seen in Britain in the course of its migration from its arctic breeding-place to its southern winter quarters, is a beautiful bird, rather over 8 inches long, with a short tail and slender, straight bill. The red-necked phalarope (*P. hyperborĕus*), which breeds in some of the most northern Scottish islands, is rather smaller than the grey phalarope.

Phallism, adoration of the generative organs as symbols of the creative powers of nature, or worship of the reproductive powers of nature as symbolized by the organs of sex. These symbols were almost in universal use in ancient religions, and phallic worship was both religious and magical. Religion has become more and more refined even among primitive and savage races, and phallic worship as a religious cult is quite a rare occurrence now. In spite, however, of the advance of civilization, phallism is still prominent in magic, which retains the baser elements of religion, and ministers to all sexual impulses, prescribing philtres and spells, and making use of amulets.

Originally phallic worship had an allegorical meaning. It was the result of gratitude and veneration for the bounties of nature, expressed in actions of sacrifice and supplication.

In Egypt the symbolism of phallic worship was associated with the worship of the bull Apis, and with the feasts of Osiris, the solar divinity. The same symbolism is found among the Phœnicians and Babylonians, and was adopted by the Jews from their idolatrous neighbours.

In Greece these symbols did not appear in the primitive mythology of the Hellenic race. They were introduced with the worship of Dionysus, and afterwards applied to that of other divinities, particularly Demeter, Aphrodite, and Apollo. Everywhere phallic worship sooner or later became associated with obscenities and licentious rites. Such was the case especially in Rome during the latter half of her history, where the offences produced by these rites were so great that they had to be forbidden by law.—BIBLIOGRAPHY: J. G. R. Forlong, *Rivers of Life*; C. Howard, *Sex Worship.*

Phallus, or **Ithyphallus**, in botany, a genus of Fungi of the division Gastromycetes. The most common British species is *P. impudicus* or *fœtidus*, popularly called *stinkhorn*, which has a fœtid and disgusting smell.

Phaneroga'mia, or **Phanerogams**, another name for Flowering Plants (q.v.): opposed to cryptogams.

Pharaoh, a title applied in the Bible to the ancient Kings of Egypt. Originally designating the Royal Palace (*Pero'*, Great House), it was applied to the Government and to the ruler himself, as in modern times the Sublime Porte is used for the Turkish Government, the Vatican for the Papal see, Downing Street or Quay d'Orsay for the British or French Government. With the beginning of the 25th dynasty (tenth to eighth century B.C.) Pharaoh is added to the other titles before the king's name, whilst in the 25th dynasty it was the only title prefixed to the king's personal name. The first king mentioned by name in the Bible is Shishak I, a contemporary of Jeroboam.

The Pharaoh under whom Joseph held office was, as is generally admitted, one of the Hyksos or shepherd kings, whilst the Pharaohs of the Hebrew oppression and *Exodus* were Rameses II, the Sesostris of the Greeks, and his son Meneptah II. The exodus took place under the reign of the latter, or under that of his successor, Seti II.

Pharisees, a religious party among the Jews which had risen into great influence at the time of Christ, and played a prominent part in the events recorded in the New Testament. They became a definite party during the Maccabæan revolt, and especially when John Hyrcanus began to reign as a secular prince and made alliances with other powers. At the time of Christ the Pharisees stood as the national party in politics and religion—the opponents of the Sadducees. The fundamental principle of the Pharisees was that of the existence of an oral law to complete and explain the written law. This oral law declared the continuance of life after the death of the body, and the resurrection of the dead. This authoritative tradition received in process of time additions which were not pretended to be derived directly from Moses, but to which the Pharisees often attached more weight than to the law itself. They also practised a rigid separation from all intercourse with the mass of the people, whom they called *am-hâ-ârez* (people of the land). This was one of the reasons why they were such bitter opponents of Jesus, in spite of the fact that they were cherishing Messianic hopes. Jesus was mingling freely with publicans and sinners, *am-hâ-ârez* (*Mark*, ii, 15–17). The Pharisees were a body of pious and learned men, patriots and nationalists, but their views, as testified by the Apostle Paul, were narrow, bigoted, ignorant, and intolerant. Among the charges which Jesus brought against them was that of misunderstanding and misinterpreting their own prophets.

Pharmacopœ'ia (Gr. *pharmakon*, a drug; *poiein*, to make) is the name applied to a book containing descriptions of the various substances and drugs used in medicine, with formulæ showing the composition of the derivatives thereof with directions for their preparation. Such books have been issued by many hospital authorities for use in their own institutions, and for the guidance of medical practitioners and pharmacists interested in the work done therein; as an example that of the Westminster Ophthalmic Hospital may be given. Previous to 1864 the Colleges of Physicians of London, Edinburgh, and Dublin each issued a pharmacopœia to cover medical practice in England, Scotland, and Ireland respectively, but in that year *The British Pharmacopœia* was published under the direction of the General Council of Medical Education and Registration of the United Kingdom, pursuant to the Medical Acts of 1858 and 1862, and immediately replaced these three authorities. *The British Pharmacopœia* has been republished many times, the last being in 1914, when its scope was extended to cover the requirements of all parts of the British Dominions. At the same time, with the object of promoting uniformity in the pharmacopœial usage of different countries, certain changes were made in the preparation, composition, and strength of important galenical compounds containing potent ingredients, so that the 1914 *British Pharmacopœia* is national in the broadest sense of the term, and also to a certain extent international in its scope.

The preparation of *The British Pharmacopœia* takes many years, and entails the co-operation of medical, pharmaceutical, chemical, and botanical authorities throughout the empire. As a result of this, it represents the position of our medical and scientific knowledge at the date of its publication. The chemical tests for purity, as one might expect in such a medical production, are of the highest degree of accuracy, and apply to definite chemical substances like potassium bromide as well as to such natural mixtures as cod liver oil. Its standards are recognized commercially, and to say that a substance is 'B.P.' is to assert that it will pass all the tests of *The British Pharmacopœia* and is therefore above suspicion, while in courts of law it is accepted as a standard for the substances and mixtures which it defines.

In accordance with modern scientific practice the centigrade thermometric scale and the metric system of weights and measures are used for all pharmaceutical and analytical computations; doses, however, are given both in the metric and imperial systems.

Other nationalities have their own pharmacopœias, though not always bearing this name, as, for example, those of France, Italy, Japan, and the United States.

Phar'macy (Gr. *pharmakon*, a drug) is the science and art of the preparation and combination of drugs so as to render them fit for administration or for external application to the human frame. Pharmacy is coeval with human needs, for accident and disease have always been the lot of man. From the earliest times pharmacy has been the hand-maiden of medicine and surgery, and the medicine-man who discovered that spider's webs and certain down-covered leaves could arrest capillary hæmorrhages practised pharmacy by modifying these simple natural methods of treatment. Many names of rulers, physicians, and philosophers have been handed down to us from dates antecedent to and at the beginning of the Christian era as associated with pharmacy, but it is difficult in the majority of cases to identify with accuracy the substances and drugs to which they refer. For example, the 'hemlock' which Socrates was obliged to drink may or may not have been the hemlock of our day, *Conium maculatum*, though on physiological grounds there is reason for believing they were identical. In the sixteenth century and later there were pharmaceutical preparations in frequent use, such as mithridatum and diascordium, complex mixtures of forty ingredients, associated with the ancient names of Mithridates and Dioscorides.

The progress of pharmacy in Great Britain is known with accuracy from about 1511, in which year the first Medical Act of Parliament was passed, whereby the faculty of medicine was vested in one body of practitioners who practised medicine, surgery, and pharmacy. The physicians allied themselves with pharmacy, and their assistants, who prepared the medicaments for use, were known as apothecaries. Gradually the latter acquired a working knowledge of the art of the treatment of diseases, and soon began to treat patients on their own account, as well as to act as preparers of medicine.

In 1540 physicians were empowered by Act of Parliament to enter the houses of apothecaries in London " to search, view, and see the apothecaries' wares, drugs, and stuffs, and to destroy such as they found corrupt or unfit for use ". In 1553 this right of search and destruction was extended to " druggists, distillers, sellers of waters and oils, and preparers of chemical medicine ". In 1617 the apothecaries obtained a charter entitling them " to sell drugs and prepare and compound medicines according to the physicians' orders and direction ", the latter still possessing the right of search; in 1623 the Society of Apothecaries established a dispensary for the purpose of making the most important preparations for the use of their own members, and in 1671 made an addition of a chemical laboratory for their own members primarily, but subsequently for the public at large. It is from this period that the name 'Apothecaries' Hall' dates, a name which carries with it still a certain amount of dignity. The apothecaries became so prosperous by virtue of their ability to practise medicine and pharmacy that in 1694 the physicians, who suffered materially from this encroachment on their domain of medicine, established dispensaries of their own, which prospered and enjoyed the patronage of the public. We have reason to believe that the assistants employed and instructed by the physicians at these institutions became dispensing chemists on their own account, and from these the origin of chemists and druggists of the present day may be dated. In 1793 the chemists and druggists had become such rivals to the apothecaries that the latter endeavoured by Act of Parliament to retain for themselves the practice of pharmacy, but this was unavailing. In 1841 the chemists and druggists founded a society under the name of The Pharmaceutical Society of Great Britain, which has existed to the present day, with the laudable objects of " benefiting the public, elevating the profession of pharmacy by furnishing the means of proper instruction, protecting the collective and individual interests and privileges of all its members, and establishing a club for the relief of decayed and distressed members ".

The Pharmaceutical Society of Great Britain early in its career established a School of Pharmacy for the education of its members, and in 1852 obtained its first Pharmacy Act, whereby the titles 'Pharmaceutical Chemist' and 'Chemist and Druggist' were confined to its members. In 1864 a second Pharmacy Act was obtained, whereby, for the protection of the public, the retail sale of poisons was made the peculiar province of members of the Pharmaceutical Society and of those who had been registered by the registrar of the society, with an exception in favour of medical practitioners who wished to do likewise. It is on this account that the dispensing of medicines is confined to chemists and druggists and pharmaceutical chemists to-day. Of recent years the term 'chemist', though belonging legally to those registered under the Pharmacy Acts, has come into common use as signifying those who deal in pure chemistry as teachers, analysts, manufacturers, &c., and to avoid confusion, the term 'pharmacist' is now legally confined to registered 'chemists and druggists', and will in course of time be the common appellation of members of the craft. The Dangerous Drugs Act of 1920 has further strengthened the position of the pharmacists by a process of authorization confined to registered chemists and druggists and pharmaceutical chemists, but the authorization may be withdrawn under certain conditions, with the result that the person concerned can sell and dispense certain poisonous substances, but not such as are specifically detailed in the Dangerous Drugs Act, viz. cocaine, opium, &c. In order that the wholesale and export trade in these drugs may not be unnecessarily curtailed, licences are issued to those engaged in these businesses, under certain conditions.

The practice of pharmacy is based on chemistry, physics, botany, and zoology, and has become, in recent years, so intricate that a given individual can only cultivate a small portion of the craft. In the sphere of crude drugs the pharmacist was dependent on the liberality of Nature, and attempted to gain a sufficiency of them by widespread searching and collection wherever the particular plants in which he was interested were known to occur. This practice has given place to large farms, where important medicinal plants, such as belladonna, henbane, and digitalis (foxglove), and such aromatic herbs as fennel and anise are cultivated on a very large scale with great advantage as to quality and quantity. In the same way plants which cannot be raised in the British Isles are cultivated abroad, two of the most important being the opium poppy (*Papaver somniferum*) and cinchona trees (*Cinchona succirubra*), the bark of which yields the valuable drug quinine, and for which immense tracts of land are under cultivation in the temperate regions of India, Java, and South America.

From the farm to the factory is but a step, and pharmacy on a manufacturing scale is the result. This includes drying-presses, where the plants are slowly dried to preserve the colour and to retain their properties unchanged; storing for a variable time, reaching to three years in the case of cascara sagrada before it is fit for medicinal use; grinding- and cutting-machines to reduce the drugs to suitable degrees of fineness for extraction of the soluble active principles by means of alcohol, ether, or water; percolators of immense size to enable this extraction to be performed efficiently; open and vacuum pans for the concentration of the percolates; and lastly, chemical testing to adjust the strength in active principles of the various preparations. Extracts may be liquid and solid; the liquids are usually made of such a strength that one ounce of drug is represented by one fluid ounce of extract; this simple rule is varied in the case of powerful remedies, as nux vomica, ipecacuanha, and aconite, where an elaborate chemical process is undertaken to determine the amount of important alkaloidal matter in the preparation, which is thereafter diluted with the appropriate solvent, so that it contains a definite percentage of pure or mixed alkaloids. In many instances, as in the cases of ergot and digitalis, it is not possible in the present state of our chemical knowledge to value a preparation by analysis, and recourse is therefore made to physiological testing, i.e. by experimentation upon the lower animals, as the guinea-pig and the barn-door cock. This method is not recognized by *The British Pharmacopœia*, but nevertheless is commonly accepted as a proof of quality. Aromatic waters, such as dill and peppermint, are made by distillation with water of the drug or the volatile oil; while certain 'spirits', especially 'spirits of sal volatile', are prepared by the same process. Ointments, which were formerly made by stirring the medicament into the melted ointment-basis, are now made by a cold process, the active ingredient, as zinci oxidum or acidum boricum, being mixed with the ointment-basis in a special mill, giving a product so free from gritty particles that one is often in doubt as to the presence or absence of the active ingredient. Pills, also, have shared in the pharmaceutical progress; at one time made laboriously by hand, they are now made by elaborate machinery capable of turning out thousands of pills per hour, perfectly rounded, and only requiring a sugar coating to render them suitable for the market. They have a great rival in 'compressed drugs', in which the drug, in a pure state or in combination with others, is mixed with a suitable binding material, and delivered in definite quantities to a stamping-machine, which compresses the whole into a solid tablet form having the excellent property of disintegrating rapidly in presence of moisture. 'Compressed drugs' have also largely replaced the mixed powders of the last generation, especially those in common use, such as grey powder.

In dispensing, the pharmacist practises these and other operations on a small scale, weighing, measuring, and mixing the various preparations prescribed by the medical practitioner, always endeavouring to present a finished article to the patient which will produce the expected results. This is the 'art of dispensing', to acquire proficiency in which demands much experience, for physical and chemical incompatibility has to be overcome somehow in order that therapeutical compatibility may remain. Further, when an unusually large dose of any therapeutic agent is prescribed, "it is the duty of the pharmacist or dispenser to satisfy himself that the prescriber's intentions have been correctly interpreted". It is curious to note in this connection that while all quantities for the preparation of pharmacopœial articles are now given in the metric system, and though it is permissible for medical practitioners to use this system in their prescribing, they prefer to use the apothecaries' measure and the symbols hallowed by centuries of usage. It is not mere prejudice, for it does not seem reasonable to make a change as long as medicines are taken by the tea, dessert, or tablespoonful instead of cubic centimetres.

The following abbreviations are used by medical practitioners in writing their prescriptions:

Gr. = grain.
℈ = scruple (20 grains).
ʒ = drachm (60 grains).
℥ = ounce apothecaries' (480 grains).

The fluid ounce is the volume of 1 ounce avoirdupois (437·5 grains) of water measured at 16·7° C.; the eighth part of a fluid ounce is a fluid drachm. The symbols given above for drachm and apothecaries' ounce are also used for fluid drachm and fluid ounce. In dispensing, the rule is 'solids by weight, liquids by measure'; hence the exact meaning of the symbol used is given by the physical conditions of the substance to the name of which it is attached.

♏ = minim, the sixtieth part of a fluid drachm.
Gtt. = (gutta), drop.
Cochl. = (cochleāre), spoonful.
Cochl. mag. = (cochleāre magnum), tablespoonful.
Cochl. parv. = (cochleāre parvum), teaspoonful.
i̇, j̇ = one (in writing quantities, Latin numerals are used).
ss. = (semisse) half (an ounce or whatever symbol or quantity it follows).
$\overline{\text{aa}}$ or ana = of each.
q. s. = quantum sufficiat (as much as may be necessary).

Pharos, the island of, close to and now part of Alexandria, which protected the port of that city. On the eastern promontory of the island stood the lighthouse of Alexandria, so famous in antiquity, and considered one of the wonders of the world, built 300 years B.C.

Pharsa'lus, a town of ancient Thessaly, near which Cæsar defeated Pompey 48 B.C. It is now represented by the small town Phersala, seat of a Greek archbishop. Pop. 1368.

Pharyngobranchii (fa-rin-go-brang'ki-ī; 'pharynx-gilled'), the name sometimes applied to the Cephalochorda, a sub-phylum of vertebrate animals, represented solely by the lancelet (q.v.).

Pharyngognathi (fa-rin-gog'na-thī), a group of spiny-finned fishes, which includes the wrasses, the parrot-fishes, the garfish, saury-pikes, and flying-fish.

Pharynx (fa'ringks), the term applied to the muscular sac which intervenes between the cavity of the mouth and the narrow œsophagus, with which it is continuous. It is of a funnel shape, and about 4 inches in length; the posterior nostrils open into it above the soft palate, while the larynx, with its lid, the epiglottis, is in front and below. The contraction of the pharynx transmits the food from the mouth to the œsophagus. From it proceed the eustachian tubes to the ears.

Phascolog'ale, a genus of small marsupials, closely allied to the dasyures, found throughout Australia, New Guinea, &c.

Phase'olus, the genus of leguminous plants to which belong the kidney-bean and scarlet-runner. See *French Beans*.

Phase Rule. See *Solution*.

Phas'midæ, stick and leaf insects, a family of orthopterous insects allied to the Mantidæ, restricted to warm countries, and remarkable for their very close resemblance to the objects in the midst of which they live, this peculiarity being their only protection against their enemies. The family includes the genera Phasma, Phyllium, Cladomorphus, &c. Some of them are destitute of wings, and have the appearance of dead twigs, while the absence of motion in the insects adds to the deception. In others, as the genus Phyllium, the wings have the appearance of withered leaves, while the brighter hue of the wing-covers of a few of larger size give to the animal the appearance of a fresher leaf.

Pheasant, the general name given to many of the game-birds included in a sub-family (Phasianinæ) of the pheasant family (Phasianidæ), which comprises several genera besides that of the pheasants proper, Phasiānus. There are usually naked spaces of skin on the head or cheeks, and often combs or wattles. The plumage of the males is brilliant, that of the females more sober, and the males carry spurs on the tarso-

Golden Pheasant (*Chrysolophus pictus*)

metatarsus. The wings are short, the tail long, the three front toes are united by a membrane up to the first joint, and the hinder toe is articulated to the tarsus. The food consists of grain, soft herbage, roots, and insects. They are chiefly terrestrial in habits, taking short rapid flights when alarmed. The pheasants are polygamous, the males and females consorting together during the breeding-time, which occurs in spring. The common pheasant (*Phasiănus colchicus*), now fully domesticated in Britain, but originally said to be a native of the banks of the Phasis in Western Asia, and to have been introduced by the Romans, is the familiar species. It extends in its distribution from the Caspian over South-East Europe. These birds breed freely in a domesticated state. The pheasant will interbreed with the common fowl, the Guinea fowl, and even with the black grouse; and there are white and pied varieties of the common species. The hybrid produced by the union of a cock-pheasant with the common hen is termed a *pero*. Other species inhabiting Southern Asia and the Eastern Archipelago are the Diard's pheasant of Japan (*P. versicolor*); Reeve's pheasant (*P. reevesi*) of China; and Soemmering's pheasant (*P. soemmeringii*), found in Japan. There are various others often put in different genera, as the silver pheasants (genus Gennæus) of China, Burmah, and various parts of India, with a generally white plumage, the feathers marked with fine black lines; and the golden pheasant of Tibet and China, the type of the genus Chrysolophus. It is noted for its brilliant colours and magnificent crest. See also *Argus Pheasant*; *Tragopan*.

Silver Pheasant (*Gennæus nycthemerus*)

Pheasant Shell (Phasianella), a genus of sea-snails, found in South America, India, Australia, the Mediterranean, &c. The shell is spiral and obovate, the outside polished and richly coloured.

Phei'dias, a celebrated Athenian sculptor, born about 490 B.C., died about 435 B.C. Among his works were three statues of Athena in the Acropolis of Athens mentioned by Pausanias, but of which nothing now remains. One, of colossal size, was in bronze, and represented the goddess in the attitude of battle. The second, which measured with its pedestal about 41½ feet in height, stood in the Parthenon, was made of ivory and gold, and represented Athena standing with a spear in one hand and an image of Victory in the other. The third, in bronze, of smaller size, was called the *beautiful*, on account of its exquisite proportions. Another colossal statue in ivory and gold, that of Zeus at Olympia, was ranked among the wonders of the world. It was removed to Constantinople by Theodosius I, and was destroyed by fire in A.D. 475. Pheidias superintended the erection of many of the finest buildings of Athens while Pericles was in power; and the sculpture of the Parthenon was probably in part by him, and as a whole reflects his spirit and influence. The bulk of the surviving pieces (known as the Elgin Marbles) are now in the British Museum, and show the nobility of conception and monumental treatment for which Pheidias is famous. Accused falsely of peculation and impiety, Pheidias is said to have died in prison.

Phellogen, in botany, the actively dividing layer (meristem) in woody stems and roots which gives rise to the protective cork and bark; also called cork-cambium.

Phelps, Samuel, British actor, born in Devonport 1806, died 1878. He was apprenticed to a printer, but took to the stage in 1827, and ten years later was appearing in London in leading Shakespearean characters, and was one of the leading performers under Macready at Covent Garden. From 1844 to 1862 he was joint manager of Sadler's Wells Theatre, where he produced thirty-four of Shakespeare's plays. He was regarded as the most accomplished Shakespearean actor of his day, excelling more especially in comedy parts such as Bottom, Justice Shallow, &c. He published an edition of Shakespeare in 1858.

Phenacetin, or **Phenacitine**, a white crystalline substance with the composition $C_{10}H_{13}O_2N$, which is an acetyl derivative of para-phenetidine. It is used in medicine as an antipyretic. The physiological action consists of a sedative action on the sensory tracts of the spinal cord, and a depressant action on the heart.

Phenol. See *Carbolic Acid.*

Phenom'enalism, a philosophical term designating any system of thought concerned with appearances. It is applied to the following two theories. (1) We only know phenomena, i.e. our knowledge is limited and our consciousness cannot penetrate to reality itself, although the thing in itself exists. This view, whilst admitting the reality of the thing in itself, denies our capacity of knowing it. It is a theory related to Agnosticism and Empiricism. (2) All our knowledge is only phenomenal, i.e. the world we experience is only a world of mind and not a world of things, as things in themselves do not exist at the back of phenomena. Reality is directly present to consciousness. Among the philosophers who have elaborated systems of phenomenalism are Hume, Berkeley, Locke, F. A. Lange, and others. —Cf. F. H. Bradley, *Appearance and Reality*.

Pheræ, an ancient city of Thessaly, which under the rule of tyrants of its own became a controlling power of the whole of Thessaly, and for long made its influence felt in the affairs of Greece. In 352 B.C. it became subject, with the rest of Thessaly, to Philip of Macedon.

Pherecydes (fer-i-sī′dēz), a Greek philosopher of the sixth century B.C., a native of the Island of Syros, and a contemporary of Thales. He is said to have taught the doctrine of metempsychosis, or of the immortality of the soul, and to have been the instructor of Pythagoras. Some fragments of his work are extant.

Phigali′a (modern **Pavlitza**, in the province of Messenia), a city of Arcadia, ancient Greece. On one of the mountains, Mount Cotylium, to the north-east of the site of Phigalia, is situated the temple of Apollo Epicurius, built in the time of the Peloponnesian War by Ictinus, the architect of the Parthenon at Athens, and still one of the best-preserved temples in Greece. The frieze, which was usually on the exterior of the temple, was here in the interior, and with the metopes was of Parian marble. The friezes, which were the glory of the temple, were purchased by the British Government in 1814 for £15,000, and are now in the British Museum. The subjects are the battle of the Lapithæ and the Centaurs, and that between the Amazons and the Greeks, the school being that of Pheidias.

Philadelphia, (1) an ancient city of Palestine, east of the Jordan, originally Rabbath-Ammon, the ancient capital of the Ammonites. (2) An important city in the east of Lydia.

Philadelphia, a city and port of entry of Pennsylvania, United States, on the Delaware River; served by the Baltimore & Ohio, and by ramifications of the Pennsylvania Railways, and also by inter-urban electric-traction services, and elevated and subway lines. Philadelphia has a population three times greater than that of any other city in the state. The site is nearly flat, but slopes gently both towards the Delaware and the Schuylkill. It is laid out on the usual transatlantic chess-board pattern (see *New York City*). Market Street, the great central street running east and west, and continuously built upon for over 4 miles, has a width of 100 feet; Broad Street, the principal central street running north and south, is built upon to about the same length, and is 113 feet in width. Most of the other chief streets vary from 50 to 66 feet broad, some of the avenues, however, being much wider. At the intersection of some are fine squares. The principal thoroughfares are laid with the lines in connection with an efficient system of tramways. Several fine bridges, both for railway and general traffic, span the Schuylkill, and a regular service of steam-ferries across the Delaware affords communication with the shores of New Jersey. Among the notable public buildings are the State House, containing a large room called Independence Hall, from the circumstance that the Declaration of Independence was signed here (4th July, 1776); the custom-house, a white marble edifice; the United States mint, a marble-fronted building; the new post office, a large and handsome granite structure with a dome; the new city hall, a splendid building of granite and marble, completed in 1889, with a tower 450 feet high, surmounted by a statue of William Penn; Girard College, a fine example of the Corinthian style; the buildings of Pennsylvania University; the permanent exhibition buildings (erected for the Centennial Exhibition of 1876), with the annexed Memorial and Horticultural Halls; and the splendid building accommodating the Academy of Fine Arts. The educational establishments include the Pennsylvania University; the Jefferson Medical College; University Medical College; the Women's Medical College; the Academy of Fine Arts; the School of Design for Women; the Academy of Natural Sciences; the Franklin Institute; numerous colleges, academies, and other educational institutions, supported by the various religious denominations; the Girard College, devoted to the secular education of orphan boys; and the public schools. Many of the above institutions possess extensive and valuable libraries, in addition to which are the large collections belonging to the Library Company, and to the Mercantile Library; and Philadelphia is one of the recognized centres of literary, dramatic, and artistic culture. In addition to the public squares the chief place of outdoor recreation is Fairmount Park, with an area of 2740 acres, possessing much natural beauty, being well-wooded and having a great variety of surface. Philadelphia ranks high as a centre of foreign, inland, and coasting trade. The leading articles of export are grain, provisions, petroleum, anthracite and gas-coal, iron and ironwares, lumber, tobacco, and cotton (raw and manufactured). The principal imports consist of cotton, woollen, and flax goods, tin-plate, iron and iron ore, chemicals, &c. Philadelphia is a great industrial centre, the first in the United States for shipbuilding, locomotives, and carpets. The other leading manufactures include iron and steel, machinery and tools, refined sugar, leather, woollens and cottons, clothing, boots and shoes, beer, and household furniture.

Philadelphia was founded and named by William Penn in 1682 as the capital of his colony of Pennsylvania. For a long time it was almost exclusively occupied and controlled by Quakers. Many of its most important improvements were due to Benjamin Franklin, and it played a most prominent part during the Revolutionary War. In 1876 (a hundred years after the Declaration of Independence) a Centennial Exhibition was held there. Pop. in 1920, 1,823,779.

Philæ, a small island of the Nile, in Upper Egypt, just above the first cataract, 5 miles south of Aswan. It contains some remarkable ruins, among which are temples, obelisks, &c. The most ancient of the temples was erected by Nectanebus I, the last of the native Pharaohs, about 378–360 B.C. There is also a great temple to Isis, built between 247 and 222 B.C.

Philanthropinism, or **Philanthropy** (Gr. *philanthropos*, loving humanity), a term applied to the system of education established by Basedow (q.v.). The theories of Basedow are based upon the ideas and teaching of Rousseau, and he introduced a method of instruction which was attractive and pleasant for the pupils. They were not only trained in a gentle manner (hence *philanthropinism*), but were made to study such subjects as were useful and practical.

Philately is the science of collecting postage stamps. The word is derived from the Greek *philos*, loving, and *ateleia*, which means exemption from payment, i.e. stamps took the place of a cash payment at the moment of posting. The hobby sprang into favour within a few years of the issue of the first postage label, which was on 1st May, 1840. On that day the famous 'Penny Black' of Great Britain came into existence, its issue being necessitated by the introduction of penny postage on 10th Jan., 1840.

Philatelists are divided into two main groups. The first and larger group comprises those who collect any and every stamp, as long as it is entitled to consideration; whilst the second is composed of enthusiasts who limit their sphere of operations to one definite country, area, or type of stamp.

General collecting is particularly suited to the needs of the young, in so much as it fosters an interest in world-wide matters of history, geography, politics, currency, &c. But the drawback to general collecting lies in the fact that so many stamps have been issued—there are now some 28,000 distinct varieties—that no one, however enthusiastic he may be, can hope to see more than a small percentage of this huge total represented in his albums.

Specialized collecting, on the other hand, is more likely to find favour with the adult philatelist. As a rule a particular country is chosen, and not only are the regular varieties sought for, but search is made for minute shades of colour, eccentricities of printing, differences of perforation, varying kinds of paper, &c. The skill and perseverance required to bring such a collection to anything approaching finality is, of course, considerable.

Specialized collections, as we have indicated, are usually concerned with a definite country, but some philatelists select a group that does not depend on any territorial considerations, so that we find albums devoted to stamps used in various wars, stamps printed only by the line-engraving process, stamps bearing the head of one particular monarch, and so on.

Whether the philatelist be a general collector or one who specializes, he needs to exercise great discrimination when gathering together the items for his albums. No stamp which is torn, discoloured, heavily obliterated, or mutilated in the smallest degree should be deemed worthy of a place in the collection. A sharp watch must also be kept for forgeries, of which there are thousands of specimens awaiting the credulous. The expert can identify a forgery by some mysterious intuition; the novice will be seldom misled if he compares each doubtful label with the particulars set out in whichever catalogue he chooses to follow.

But torn specimens and forgeries are not the only items which should be shunned by the discriminating collector. Many genuine stamps are not worth the slightest consideration. We have in mind the issues which certain countries print not so much for postal purposes as to please the eye of the unsuspecting novice. Such speculative issues emanate largely from South and Central America as well as New Europe, and are sold in greater quantities to collectors than to people who wish to frank their letters. As a rule these issues are made to celebrate some event, important or otherwise, and are designed and produced in lavish style.

Among the stamps which will always be prized are the early issues and especially the high values of Great Britain. The embossed adhesives of 1847–54, the first surface-printed issue of 1855, and the series which followed in 1862 increase in value each year. Some of these stamps, it is true, are worth only a few shillings, but others sell for many pounds, while one at least, the 10*d.* red-brown of 1865, changed hands recently for £240. The early issues of Australia, chiefly those printed by Messrs. Perkins, Bacon & Co., are also much sought after, and the same can be said of the first sets of the various Canadian provinces. The original issues of the United States, of France, and of the Italian states are also among the most valuable stamps. All these stamps are gilt-edge investments.

Of one rare and attractive stamp only twenty-six copies are known, but others are probably still awaiting to be unearthed. This is the 'Post Office' 2*d.* deep-blue Mauritius, issued in 1847. In Paris, recently, a single copy, nicely postmarked and well preserved, was sold for the fabulous sum of £4670. Fifty years ago the price was less than £10!

As rare specimens of various issues are being periodically brought to light, those who are lucky enough to chance upon such finds cannot be too strongly urged to dispose of their discoveries with caution. The first offer may be absurdly small, and in the long run the best price is gained at auction. Whilst awaiting a sale, stamps should be most carefully handled, blocks and panes should not be split into small sections, and used specimens must not be torn from their original envelopes.

Phile'mon, a Greek dramatist of the fourth century B.C. Fragments of his comedies still exist, and are usually printed in editions of Menander, who was his contemporary and rival. He resided for some time at the court of Ptolemy, and is said to have died after laughing too heartily at the success of one of his plays. He was an admirer of Euripides, and said that if he were quite sure that the dead had perception he would hang himself to see Euripides. He was imitated by Plautus in his *Mercator* and *Trinummus*. We have the titles of fifty-seven of his plays, but no complete play.

Phile'mon, Epistle of Paul to, one of the books of the New Testament. This epistle, according to the prevalent opinion, was, together with the epistles to the Ephesians, Colossians, and Philippians, written from Rome during St. Paul's first imprisonment in that city. In this letter Paul appeals to his friend on behalf of one Onesimus, a runaway slave, who had become a convert to Christianity. Paul pleads for the culprit, and even hints at emancipation. The epistle throws light upon the Apostle's attitude towards slavery, and although he does not recommend abolition, he pleads for a humane and brotherly treatment, based on Christian principles.—Cf. J. Moffat, *Introduction to the Literature of the New Testament.*

Phile'tas of Cos, Greek grammarian and poet, flourished between 350 and 290 B.C. He wrote elegies, epigrams, and prose grammatical works. He was preceptor to Ptolemy Philadelphus, and a favourite model of Theocritus. Fragments of his poems are extant.

Phil'idor, François André Danican, French musical composer and celebrated chess-player, born 1726, died 1795. He travelled in Holland, Germany, and England, and in 1753 he set Dryden's *Ode for St. Cecilia's Day* to music. He produced about twenty operas at the Opéra Comique, and set to music Horace's *Carmen Seculare*, his best work. The chess opening known as Philidor's Defence consists in Black replying to White's second move of Kt to KB3 by playing P to Q3.

Philip, one of the twelve Apostles, according to John's gospel "of Bethsaida, the city of Andrew and Peter", and who was called to follow Jesus at Bethany. In the Western Church he is commemorated on 1st May.

Philip, the Evangelist, often confounded with Philip the Apostle, is first mentioned in *Acts*, vi, 5. He preached at Smyrna, where Simon Magus was one of his converts; baptized the Ethiopian eunuch; entertained Paul and his companion on their way to Jerusalem, and "had four daughters which did prophesy".

Philip II, King of Macedonia, the most famous of the five Macedonian kings of this name, was a son of Amyntas II, born 382 B.C. He passed a portion of his early years in Thebes, where he became well acquainted with Greek literature and politics, and succeeded his elder brother Perdiccas in 360. His position at first was not very secure, but as he had few scruples and was a man of the highest talents both for war and diplomacy, in a short time he had firmly established himself, had reorganized the Macedonian army, and proceeded to extend his sway beyond his own kingdom. His ambition was to make himself, in the first place, supreme in Greece, and to accomplish this he began by seizing the Greek towns on his borders: Amphipolis, which gave him access to the gold-mines of Mount Pangæus, Potidæa, Olynthus, &c. The 'sacred war' carried on by the Amphictyonic Council against the Phocians gave Philip his first opportunity for interfering directly in the affairs of Greece. (See *Greece*.) After the capture of Methone, between 354 and 352, Philip made himself master of Thessaly, and endeavoured to force the pass of Thermopylæ, but was repulsed by the Athenians; Philip, however, compensated himself by equipping a navy to harass the Athenian commerce. The terror of his name now provoked the *Philippics* of Demosthenes, who endeavoured to rouse the people of Athens to form a general league of the Greeks against him; but by 346 he was master of the Phocian cities and of the pass of Thermopylæ, and as general to the Amphictyon Council he was the crowned protector of the Grecian faith. In the spirit proper to his office he marched into Greece to punish the Locrians for an act of profanity; but instead he seized the city of Elatea, and began to fortify it. Demosthenes now exerted all his eloquence and statesmanship to raise the ancient spirit of Grecian independence, and a powerful army was soon in the field, but being without able or patriotic commanders, it was defeated at the decisive battle of Chæroneia in Aug., 338 B.C. After this last struggle for freedom Philip was acknowledged chief of the whole Hellenic world, and at a congress held at Corinth he was appointed commander of the Greek forces, and was to organize an expedition against Persia. While preparing for this enterprise he was murdered in 336 B.C., some say at the instigation of his wife Olympias.—Cf. D. G. Hogarth, *Philip and Alexander of Macedon.*

Philip I, King of France, son of Henry I, was born 1052, died in 1108. He succeeded to the throne under the guardianship of Baldwin V, Count of Flanders, in 1060. The Norman Conquest of England took place in his reign, and he supported Prince Robert, son of the Conqueror, in his revolt against his father. He was a worthless debauchee, and was detested by his subjects.

Philip II, Augustus, King of France, born 1165, died in 1223. He was crowned as successor during the lifetime of his father Louis VII, whom he succeeded in 1180. One of his first measures was the banishment of the Jews from the kingdom, and the confiscation of their property. Philip next endeavoured to repress the tyranny and rapacity of the nobles, which he effected partly by art and partly by force. In 1190 he embarked at Genoa on a crusade to the Holy Land, where he met Richard Cœur de Lion, who was engaged in the same cause in Sicily. The jealousies and disputes which divided the two kings induced Philip to return home the next year. He invaded Normandy during Richard's captivity (1193), confiscated the possessions of King John in France after the death of Prince Arthur (1203), prepared to invade England at the instance of the Pope (1213), turned his arms against Flanders, and gained the celebrated battle of Bouvines (1214).

Philip III, called the *Hardy*, King of France, was the son of Louis IX and Margaret of Provence, born 1245, and died in 1285. He succeeded his father in 1270. In 1271 he possessed himself of Toulouse on the death of his uncle Alphonso; in 1272 he repressed the revolt of Roger, Count of Foix; and in 1276 sustained a war against Alphonso X, King of Castile. The invasion of Sicily by Peter of Aragon, and the massacre of the French, known as 'the Sicilian vespers', caused him to make war against that prince.

Philip IV (*Le Bel*), King of France, born in 1268, and died in 1314. He married Joanna, Queen of Navarre, in 1284, and succeeded his father in 1285. He attempted to take Guienne from Edward I of England, but afterwards entered into an alliance with that monarch, and gave him his daughter in marriage (1299), from which originated the claim of Edward III to the crown of France. He was long engaged in war with Flanders, and treated the country as a French dependency, but was defeated at Courtrai in 1302. Philip had been engaged at the same time in a violent dispute with Pope Boniface VIII, and he publicly burned the Pope's Bull excommunicating him. On the death of Boniface and of Benedict XI, Clement V, who succeeded the latter, was elected by the influence of Philip, and fixed his residence at Avignon. The result of the king's alliance with the new Pope was the destruction of the order of the Templars (1307–12), and the seizure by the king of their goods and estates was one of its fruits. Philip left numerous ordinances for the administration of the kingdom, which mark the decline of feudalism and the growth of the royal power. He also convoked and consulted the States-General for the first time.—Cf. E. Boutaric, *La France sous Philippe le Bel.*

Philip VI (of Valois), King of France, first of the Valois line, born in 1293, died in 1350. He was the nephew of Philip IV, to whose last son, Charles IV, he succeeded in virtue of the Salique law. In his reign occurred the wars with Edward III of England, who claimed the French crown as grandson, by his mother, of Philip IV. His reign was unfortunate for France on account of the beginning of the Hundred Years' War; and he has left an evil memory by his persecutions of Jews and heretics, his confiscations and exactions.

Philip II (of Spain), the son of Charles V and Isabella of Portugal, was born at Valladolid in 1527, died in 1598. He was married in succession to the Princess Mary of Portugal (1543), and to Mary of England in 1554, the same year in which he became King of Naples and Sicily by the abdication of his father. In 1555 his father resolved to abdicate the sovereignty of the Netherlands in Philip's favour. This was done in public assembly at Brussels on 25th Oct., 1555; and on 16th Jan., 1556, in the same hall he received, in presence of the Spanish grandees then in the Netherlands, the crown of Spain, with its possessions in Asia, Africa, and America. His first act was to propose a truce with France, which was broken almost as soon as concluded. On the death of Mary in 1558 Philip made proposals of marriage to her sister and successor, Elizabeth, but was refused. In 1559 the French War was concluded by the Peace of Câteau-Cambrésis and the marriage of Philip to Elizabeth of France, daughter of Henri II. The king then returned to Spain, resolved upon checking the progress which the Reformation had made there. On his arrival in his native country he had the satisfaction of being present at an *auto-de-fé*; and a few years' perseverance in similar measures extinguished the light of the Reformation, together with the spirit of freedom and enterprise in Spain. In Naples, as in Spain, his zeal led him to persecute the Protestants; but it was in the Netherlands that his bigotry and obstinacy had their most disastrous, though ultimately fortunate results. In 1566 the revolt of the Netherlands commenced, which ended in the separation of the seven northern provinces from the crown of Spain, and their formation into the Dutch Republic. This struggle lasted about thirty years, till the close of Philip's reign. The rebellion ruined the prosperity of Philip's dominions, whilst Spain's naval supremacy was shattered by the defeat of the Armada which Philip sent against England in 1588. Few kings have been the subjects of so much historical controversy or so diversely judged as Philip of Spain. Execrated by not a few, he was worshipped by others. He was the 'prudent king' of the Spaniards, and the 'demon of the south' of the Protestants. Impartial modern historians, however, agree that although full of faults, he was not without virtues. "He had devoted his life to the task of establishing the universal supremacy of Catholicism." He looked upon himself as a sort of junior partner of Providence, and he did not scruple to encourage cruelty and assassination if they furthered his purpose. Even Catholics admit that "imbued with ideas of absolutism, he was led into acts disapproved by the moral law". On the other hand, he was industrious, pious, and to some extent conscientious, and he was also a patron of arts.—BIBLIOGRAPHY: M. A. S. Hume, *Spain: its Greatness and Decay*; *Philip II*; W. H. Prescott, *History of the Reign of Philip II*; H. Forneron, *Histoire de Philippe II*.

Philip V (of Spain), the first Spanish king of the Bourbon dynasty, was born at Versailles 1683, died 1746. He was the grandson of Louis XIV of France, and succeeded to the crown of Spain by the will of Charles II, who died without direct heirs, as the grandson of Charles's elder sister. On the death of Charles in Nov., 1700, he was immediately proclaimed king, and the result was the War of the Spanish Succession, which began in 1702. By the Treaty of Utrecht (1713) he was recognized as King of Spain, but Gibraltar was lost to Spain, Minorca was also ceded to England, Sicily to Savoy, the Netherlands, Naples, and the Milanese to Austria. He married Elizabeth Farnese, niece of the Duke of Parma, in 1714, and Alberoni, the minister of the Duke of Parma in Spain, became Prime-Minister. The king was, however, compelled to dismiss him in 1719, on account of the hostility aroused among Powers against Alberoni, who wished to regain the lost Spanish possessions in Italy. In 1724 Philip resigned the crown of Spain in favour of his son Don Louis, but the death of Louis a few months later induced him to resume the royal power. Philip was constantly governed by favourites, and his constitutional melancholy at last completely incapacitated him for business.

Philip (*the Bold*), Duke of Burgundy, son of John II, King of France, born in 1342, died in 1404. He fought at Poitiers (1356), where, according to Froissart, he acquired the surname of the Bold. He shared his father's captivity in England, and on his return his father, whose favourite he was, made him Duke of Touraine, gave him the Duchy of Burgundy, and made him premier peer of France. Philip was one of the most powerful French princes during the minority of Charles VI, during whose insanity he acted as regent, retaining the regency till his death.

Philiphaugh, a locality in Scotland 2 miles s.w. of Selkirk, the scene of Sir David Leslie's victory over the Marquess of Montrose, 13th Sept., 1645. A monument marks the field.

Philippeville (ancient **Rusicada**), a city and port of Algeria, the chief town of an arrondissement in the department of Constantine, on the Bay of Stora; served by railway connecting with Constantine, Batna, and Biskra, for which it is the seaward terminus. It was founded by the French in 1837, but occupies the site of successive Phœnician and Roman settlements, and the Roman reservoirs, largely restored and fed by canal from the Wadi Beni Meleh, are still the source of Philippeville's water-supply. There are remains also of a Roman amphitheatre. In 1914 the city was bombarded by the cruisers *Goeben* and *Breslau*. Pop. 21,251.

Philip'pi, a city of Macedonia, now in ruins, founded by Philip of Macedon about 356 B.C. The two battles fought in 42 B.C., which resulted in the overthrow of Brutus and Cassius by Antony and Octavius, were fought here. Philippi was visited on several occasions by the Apostle Paul, who addressed to the Church there one of his epistles.

Philip'pians, Epistle to the, one of St. Paul's epistles. The keynote of the letter is an expression of the sentiments of joy and gratitude which the Apostle cherishes in regard to the Philippians. The epistle is supposed to have been written from Rome towards the close of his first imprisonment there, about A.D. 63. Some authorities suppose it to have been written in Cæsarea. The genuineness of this epistle has been little questioned. It is referred to, though not quoted, in the epistle of Polycarp and by Tertullian and other early Fathers. Epaphroditus, who conveyed it, was the messenger of the Philippians to Paul, and had been ill at Rome, which had been a cause of anxiety to the Philippians. Paul, therefore, hastened his return, and sent this epistle by him.

Philippine Islands, the largest island group of the Malay Archipelago, extending between Taiwan in the north and Borneo and the Moluccas in the south, and embracing in its 2441 named islands (another 4642 are unnamed) an area of 114,400 sq. miles. The total population (1918) is 10,350,730, the indigenous population being of Malay extraction, and 91·5 per cent of Christian faith, mainly Roman Catholic.[1] Manila (q.v.) is the capital and administrative centre.

The eleven principal islands are: Luzon (area, 40,814 sq. miles); Mindanao (36,906 sq. miles); Samar (5124 sq. miles); Negros (4903 sq. miles); Palawan (4500 sq. miles); Panay (4448 sq. miles); Mindoro (3794 sq. miles); Leyte (2799 sq. miles); Cebú (1695 sq. miles); Bohol (1534 sq. miles); and Masbate (1255 sq. miles). Iloilo on Panay (pop. 48,000), Cebú on Cebú (46,000), Zamboanga on Mindanao (30,000), and Laoag (46,000), Albay (43,000), Vigan (19,000), and Naga (13,000) on Luzon, are the principal towns. As in India, there is a summer capital, Baguio, in the Mountain Province, the Philippine Simla.

Climate.—The average temperatures are high, with excessive humidity, a heavy rainfall, and occasional typhoons of exceptional violence, which usually cause much loss of life.

Communications.—Manila is the great centre of both *Thalassic* and *Oceanic* inter-communication and trade, the other principal ports being Iloilo (Panay) and Cebú (Cebú). There are about 778 miles of Government controlled railways (1920), and inland water-ways are navigable for many miles by small craft and by bamboo rafts.

Production.—The staple products are manila hemp (abacá), rice, sugar-cane, coco-nuts, tobacco, maguey, and corn, rice being the most important crop and the staple native food. Agriculture is the principal industry, but is very primitive. Coco-nut oil is manufactured in nine large factories. Over 40,000 sq. miles of the Philippines are afforested, and produce gums and resins, bamboo, rattan, and dye-woods. Gold, iron, silver, manganese, and copper are among metallic minerals. Natural mineral-waters, salt, gems, gypsum, natural gas, petroleum, asbestos, lime, clay, stone, and coal are also worked. Hats made from pandan, bamboo, &c., form an important article of manufacture and export to Great Britain and other European countries, and to the United States.

Commerce.—The great bulk of trade is with the United States, Japan, and China, but exports to Great Britain and the Netherlands are large and steady.

Education.—Education is free and undenominational, English being the recognized language. There is a State University of the Philippines, and a Roman Catholic university (San Tomas) controlled by the Dominican order. Public newspapers and periodicals include 21 English, 22 Spanish, 15 bi-lingual (English-Spanish), 2 Chinese, and about 40 others in miscellaneous dialects and tongues.

Government.—The Philippines are administered by a Governor-General representing the United States. He is appointed by the President of the United States in consultation with the Senate of that Power. In the same manner, a Vice-Governor is appointed to fill the office of Secretary of Public Instruction. The Governor-General is the chief executive, and under him are the six executive departments of the Interior, Public Instruction, Agriculture, Commerce and Communications, Finance, and Justice. There is a legislature comprising a Senate (24 members, 22 elected and 2 appointed) and a House of Representatives (91 members, 82 elected and 9 appointed). The Council of State connects the legislative and executive bodies, and comprises the Governor-General (President), the respective Presidents of the Senate and House of Representatives, and the departmental secretaries, who are all Filipinos. There are 36 provinces and 12 'special' provinces, the latter being managed by a Bureau of non-Christian Tribes, and the former individually by officials elected on a popular vote.

History.—Magellan discovered the Philippines in March, 1521, and was killed on the Island of Mactan. He named the archipelago San Lazarus. Villabos named some of the islands the 'Islas Filipinas', and, in an expedition fitted out by Philip II of Spain (1561), the sailing directions make use of the new title as covering the entire archipelago. San Miguel was founded by Miguel Lopez de Degaspi in 1565, and was the first permanent Spanish settlement. Under Spanish rule missionaries were imported, and the Roman Catholic faith was preached throughout the islands. In 1762 Manila was taken and held until 1764 by a British fleet of thirteen ships under Admiral Cornish, and the Americans seized it in 1898 (Spanish-American War). By a treaty signed at Paris on 10th Dec., 1898, the islands passed from Spain to the United States, under whose government economic development has been steady and political stability assured.—BIBLIOGRAPHY: J. R. Arnold, *The Philippines*; A. H. Savage-Landor, *The Gems of the East*; E. H. Blair, &c., *The Philip-*

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[1] There is an independent Filipino Church, founded in 1901, but their religious dogmas are practically identical with those of the Roman Catholic Church.

pine Islands, 1493–1898 (55 vols.); J. Foreman, *The Philippine Islands*; F. W. Atkinson, *The Philippine Islands.*

Philippop'olis, or Plovdiv, a city of Bulgaria, on the Maritza; served by the Sofia-Constantinople trunk line of the transcontinental railway from Vienna, via Belgrade. The city is built mainly on a hill which overlooks the river, and is the centre of a large trade, its manufactures being silk, cotton, and leather. Philippopolis is so named from Philip of Macedon, who captured the Thracian town of Eumolpia, which he made a frontier post. As a Roman city (*Trimontium*) it was the capital of Thracia. Pop. 45,700.

Philippsburg, a town of Baden, on the Rhine; served by the Bruchsal-Germersheim Railway. It was formerly a celebrated imperial fortress. In 1734 it was captured by the French under the Duke of Berwick (who lost his life here), and its fortifications were razed in 1800. Pop. about 4000.

Philips, Ambrose, English poetaster, born of a Leicester family in 1671, died 1749. He was educated at St. John's College, Cambridge, and subsequently became one of the wits who frequented 'Button's coffee-house' in London. As a Whig politician he obtained various lucrative posts from the House of Hanover, while as a poet he was ridiculed by Swift and Pope, receiving the nickname of 'Namby Pamby'. He wrote six pastorals and three tragedies: *The Distrest Mother* (1712), taken from Racine; *The Briton* (1722); and *Humphrey, Duke of Gloucester* (1723).

Philips, John, an English poet, born in Oxfordshire 1676, died at Hereford 1708. He was educated at Christ Church, Oxford, where he produced *The Splendid Shilling*, a burlesque poem in Miltonic blank verse. He subsequently wrote *Blenheim*, a poem in celebration of the Duke of Marlborough's victory; and *Cyder*, a work in imitation of Virgil's *Georgics.*

Philis'tines, the name of a people or race who lived south-west of Judæa, on the coast of the Mediterranean Sea. They came from Caphtor (Egy. *Kptar*), now identified with Crete (*Amos*, ix, 7), and permanently settled in Canaan during the reign of Rameses III (about 1200–1169 B.C.). They occupied five cities, Ashdod, Gaza, Gath, Ashkelon, and Ekron, which formed a kind of confederacy under five lords or chiefs.

They then established themselves all over the land, which has been named Palestine after them. During the reigns of Saul and David they had attained their highest power, but being constantly at war with the Hebrews, they were several times defeated by the latter. The country of the Philistines was subdued by Tiglath-Pileser (734 B.C.), and their independence entirely crushed by Sennacherib, and Zidka of Ashkelon, who ruled also over Joppa, was carried off to Assyria.

Racially there is much similarity between the Philistines and other Mediterranean peoples. They were to a certain extent advanced in civilization when they came to Syria, had a knowledge of metals, were the inventors of the art of the smith, had iron tools and weapons, and most probably a system of writing. It was, above all, their political organization which distinguished the Philistines from their Semitic neighbours. They seem to have possessed a deeper sense of individual liberty, and to have enjoyed more freedom than the Semites. Nothing is known of their original speech. In Syria they adopted the language of Canaan, and in the time of Nehemiah the speech of Ashdod still differed from that of Jerusalem. Their principal god was Dagon, who had temples at Gaza and Ashdod. They also worshipped Astarte and Baal.—Cf. R. A. S. Macalister, *The Philistines: their History and Civilization.*

Phillip, John, British painter, one of the greatest colourists of the British school, born at Aberdeen 1817, died 1867. He came to London in 1836 and studied at the schools of the Royal Academy. From 1838 to 1851 his pictures consisted mainly of portraits and subjects from Scottish life, such as *The Catechism* (1847), *The Baptism* (1850), and *The Scotch Washing* (1851). In 1852 and 1856 he visited Spain, and he again returned to that country in 1860. While resident there he was greatly influenced by the works of the Spanish masters, and especially by those of Velasquez. His style completely changed, his subjects became Spanish, and his grasp of colour, composition, and character vastly improved. It is his pictures of Spanish life that have made him famous.

Phillips, Stephen, British dramatist and poet, was born in 1868, and died in 1915. He was educated at Stratford and Peterborough, and was for a short time at Queens' College, Cambridge. For six years he was a member of Sir F. R. Benson's dramatic company, and, after being an army tutor, he adopted literature as a profession. His principal volumes of poetry are *Marpessa* (1890), *Eremus* (1894), and *Christ in Hades* (1896). In response to a certain demand for a literary drama, Phillips wrote *Paolo and Francesca* (1900), which was produced at the St. James's Theatre in 1901. It was extremely successful, owing its success, however, not so much to its literary merits as to the total absence of such merits in contemporary dramas. His other plays include: *Herod* (1900), *Ulysses* (1902), *The Sin of David* (1904), and *Nero* (1906). None of these was so popular as *Paolo and Francesca.* They are all somewhat florid and declamatory, but have some value as stage-plays owing to their author's practical knowledge of the stage. Phillips to some extent outlived his reputation.

Phillips, Wendell, American abolitionist, born at Boston, United States, 1811, died 1884. He was educated at Harvard University, studied law, and was called to the Bar (1834); joined the movement for the abolition of slavery in 1837, and gave it the aid of his oratorical gifts and unremitting advocacy until in 1865 the negroes of the United States were made free citizens. His *Speeches, Letters, and Lectures* were published in 1863.

Philo (often called *Philo Judæus*), Jewish philosopher and theologian, born at Alexandria about 20 B.C. He belonged to a wealthy family and received a liberal education, being brought up in the Alexandrian school of hellenized Judaism. The Hebrew Scriptures he knew only through the *Septuagint*. In A.D. 40 he was sent as one of a deputation from the Jews of Alexandria to the Emperor Caligula, to persuade him to revoke the decree by which he compelled the Jews to pay divine honours to his statue. Philo's philosophy was strictly theosophical, resting on the Scriptures, as an inspired revelation, and those systems of Greek philosophy which best harmonized with the Scriptures, such as the philosophy of the Stoics and of Plato. He conceived the Deity as transcendent, most universal of beings, higher than knowledge, goodness, or beauty *per se*, and manifesting Himself in the material universe by His creative activity or operations, nowhere in His essence. Between God and the world he places the Logos, which he calls the Son of God, the Paraclete, and Mediator between God and man. It contains in itself the powers or spiritual forms which pervade the universe, and which are creative. Out of unqualified matter, passive and lifeless, destitute of form and quality, God created the world by means of the Logos, or the agencies and potencies residing in it. The law, Philo maintained, was an emanation from Him who was both the creator and the father of the universe, and in harmony with nature.—BIBLIOGRAPHY: J. Drummond, *Philo Judæus*; Schürer, *The Jewish People in the Time of Jesus Christ*.

Philology and Linguistics. The term *philology* originally meant the study, both literary and linguistic, of the writings of a people, especially of the Greeks and the Romans. It was an historical science, concerned with the critical study of literature from the archæological, artistic, and mythological points of view. It included, in addition to the study of national cultural values —for it investigated writings of a people for the purpose of learning its thoughts, culture, and art —also a linguistic side. On the Continent the term is still used in this sense, whilst the science of language itself is termed *linguistique* in France, or *Sprachwissenschaft* in Germany. Indeed there is a vast difference between philology and the science of language, the former being an historical, the latter a natural science which studies the constituent elements of a language, and the various forms and changes which these elements undergo, or are capable of undergoing. It treats of sounds and word formation, syntax (correct use), and developments of meanings. It is therefore divided into *phonetics*, or *phonology*, *morphology* (Gr. *morphē*, shape), *comparative syntax*, and *semasiology* (Gr. *semasia*, meaning). Schleicher (1821–68) rightly pointed out that the student of language resembles the botanist, who studies plants and the laws of their structure, whilst the philologist is more like a horticulturist, who cares more for the beauty of form, for colour and perfume. In England, however, the term philology, in its modern usage, is applied to the science of language, and when we speak of philologists we mean the students of language and of its principles in general. When, for purposes of comparison, this science, instead of limiting itself to *one* language, includes several languages of a kindred group, it becomes comparative, and is termed *comparative philology*. The reason of this shifting of the term and its application to linguistics is due to the fact that the first scholars who inaugurated the science of language were philologists, or students of national culture and of the criticism of ancient literature.

The Origin of Language.—Of the origin of speech we know little. From very early times speech has been recognized as the chief criterion whereby to distinguish man from the brutes. Yet, as elsewhere in nature, the hard-and-fast line is drawn only by man to suit the systems which he constructs; in nature itself clearly marked divisions are not conspicuous. Darwin observed in the case of the dog that the species which had associated with man, and had, so to speak, shared in his civilization, had developed several notes which are entirely wanting in the cry of the wild dog. It may be plausibly argued that the same is true of man; that he, possessing at first but a few incoherent and inarticulate cries to indicate pleasure or pain, amazement or fear, developed in process of time, as his needs and his skill in supplying them increased, a system of sounds which conveyed those impressions with more precision to his associates. Most animals, at any rate probably all gregarious animals, are able to impart to their comrades warning of impending danger, or to indicate the proximity of food. But, so far as we can tell, man is the only animal which can communicate information to his fellows regarding the nature of the impending danger, or the kind of food which he has discovered. Man has therefore rightly been defined as 'a speaking animal'.

Besides the cries of pain, pleasure, and other feelings to which the first elements of language have been attributed, a considerable number of sounds arose from imitation of animals' cries. Imitation may arise from two causes, from delight in mimicry, or from the inspiration of necessity as an aid in the arts of hunting. It is no doubt true that many of the imitative (onomatopoeic) forms of modern languages are of comparatively recent origin; but we have no reason to believe that forces operating in recent times in language have not operated throughout the history of the race, while the necessity for these imitative sounds was, in primitive times, certainly more pressing. Moreover, whatever the natural gifts of the human being for the art of mimicry, it is certain that in the early years of childhood, after the first months of infancy are passed, imitation is the method by which most things are learnt. The theories which attribute the origin of language to imitation and exclamation are known respectively as the *bow-wow* and *pooh-pooh* theories.

A third possible source of language ought also to be mentioned. Children have often been observed in their play to invent a vocabulary for themselves, a great deal of which was composed of babbling sounds, without reference to the words of the language that they knew. Often words of this sort, or others which have been manufactured out of ordinary words metamorphosed beyond recognition by infantile talk, remain a part of the nursery vocabulary long after the speakers are perfectly competent to talk the language of their parents. The nursery language is not permanent, because of the overpowering influence of the language current in the larger world outside; it would not, however, be unreasonable to assume that primitive man, who was more like the infant in his development, and was not exposed to similar external influences, may have manufactured no small part of his vocabulary on the same principles.

It is this side of language which most closely approaches to singing. Some authorities, indeed, contend, and not without plausibility, that man might with equal propriety be defined as a singing animal. The difference between speech and song consists in the greater variety of pitch which prevails in the latter, and in the more rhythmic intervals between the sounds. It has been observed that the higher the civilization of a people the more monotonous is the pitch of its language. All languages, however, even though, like English, they may carry this monotony very far, nevertheless vary the pitch of individual words and syllables in the sentence. Some of the languages belonging to the same family as English, such as Swedish and Norwegian, retain a large number of tones which literary English has lost, though tones of the same sort may be heard in various English dialects.

Another problem connected with the origin of language is that of the relation between speech and thought. Professor Max Müller held very emphatically that thought was impossible without speech, and conversely that speech was impossible without thought, the two being facets, as it were, of the same diamond. The first part of the theory was held strongly also by the German philosopher Noiré. Professor Max Müller's theories and views have been contradicted by W. D. Whitney (1827–94) in his famous work *Life and Growth of Language*.

Change in Language.—Language is ever in a state of flux. Even when to some extent stereotyped by the existence of a literature, it is continually changing. We have only to think of the tremendous changes which have taken place within the last thousand years in English—the tongue of a community with a continuous literature and uninterrupted political development—to realize how great in a short time the changes might easily be in a small community loosely held together and without either literature or stable political institutions. Nor is the possibility of change confined to vocabulary. The pronunciation of language is continually changing. In Queen Anne's time *tea* was pronounced, as it still is dialectically in Scotland and Ireland, *tae* or *tay*.

> Here thou great Anna whom three realms obey,
> Dost sometimes counsel take and sometimes tea.

Since the time of the poet Cowper *balcony* has followed the analogy of the majority of English words, and has transferred its accent from the second syllable to the first. Even in the present day, when communication between all parts of the world is so easy, the pronunciation of an American is easily distinguishable from that of an Englishman, even if there be no difference in vocabulary. Another type of English bids fair to develop in Australia. And here it is of importance to note that there is no necessary connection between race and language, although it is a frequent and widespread error to assume that different portions of the same race will talk the same language, or at any rate languages closely akin. Yet instances within the period covered by historical records will illustrate the fallacy. The people of Cornwall and of Wales are of the same origin; but while in Wales the language is still spoken which was spoken at the time of the Saxon invasion, in Cornwall it has been replaced by English. Similarly, the Roman conquest of ancient France (Gaul) caused the inhabitants to resign their earlier language in favour of a dialectic form of Latin, the language of their conquerors from Italy.

The alterations and changes of a language are due to various causes. They are either connected with the mechanism of speech, and are called phonetic change (see *Phonetics*), or are due to assimilation. The greatest change-effecting cause in language is, however, analogy. Language consists in the communication, by means of sounds, of one's ideas; it is an improvement upon gesture and is less laborious. Now this tendency of labour-saving always continues, and the human mind is always ready to simplify and to systematize. All the phenomena of formation or change in language due to that instinct of simplifying are classed under analogy. The notion of a plural, for instance, was commonly associated with the sign *s*, and people consequently said *eyes* and *heads*, instead of *eyn* and *head*, just as children will say *foots* and *mans*. The evolution of language has therefore always been in the direction of the least effort, not only to the speaker, but also to the hearer.

The history of the vocabulary of a language—of its words as distinct from its sounds—is no less complicated than that of the sounds themselves. In any language the part that consists of original creations is comparatively small. A large proportion of the words are formations derived, as we have just seen, by additions and modifications of various kinds from words already existing. A third series of words, which in most languages form an important part of the whole vocabulary, consists of words taken over either from other dialects of the same language or from other languages. No language is so remarkable in this respect as English, the vocabulary of which includes words borrowed from almost every language under the sun.

With regard to words borrowed from other dialects of the language itself, this may be exemplified by the fact that in English the southern *vat* has replaced the older *fat* still found in the Bible (twice in *Joel*), while *fox* has displaced the older *vox*, which still survives in its feminine *vixen*. From northern dialects the borrowings have been more numerous. The same influences affect the syntax of a language. Languages of kindred formation probably affect one another most readily. On the other hand, the syntax of English has to some extent been modified by French influences.

Morphology.—According to the structure of the words (*morphology*), philologists have classified the languages of the world into three great divisions, including within them various families of languages which are similar in formation but are not necessarily directly related.

1. *Isolating Languages.*—Of these Chinese is the most typical. Here there is no difference distinguishable between the parts of speech. Each symbol of the extremely complicated system of writing represents a monosyllabic word which expresses a general idea without regard to the nature of that idea, or to whether it has the value of a verb or of a substantive. The meaning of the passage has to be gathered (*a*) from the order of the words, (*b*) from the intonation. In Chinese, and also in the other monosyllabic languages, though to a less extent, there are a number of tones which distinguish words containing the same articulated sounds one from another.

2. *Agglutinative Languages.*—Here suffixes are added to roots to indicate various relations. The same suffixes appear in the verb and in the substantive in different relations. Thus in Hungarian, which is one of these languages, we find:

ház-unk, our house.	*var-unk*, we sow.
háza-tok, your (plural) house.	*var-tok*, you sow.
ház-ok, their house.	*var-n-ak*, they sow.

Owing to the possibility of adding together a great number of suffixes in the agglutinative languages, there is no difficulty in expressing a statement of considerable length by one word. The boundary-line between agglutinative and inflectional languages is not always easy to draw. Thus Finnish, the most highly developed of these languages, appears, as far as its substantive is concerned, to be an inflectional language of a very elaborate kind, there being at least fifteen cases. Contrary to the practice of inflectional languages like Latin or Greek, the same suffix is applied to the same case in both singular and plural.

8. *Inflectional Languages.* — These are represented by the two groups of the Semitic and Indo-European languages. It is from the speakers of languages of these two groups that almost everything most beneficial to the development of the human race has sprung. The Semitic languages are: (*a*) Hebrew, closely akin to which were the other ancient dialects of Canaan, Moabite, Phœnician, &c.; (*b*) Arabic, widely spread as the result of Mahommedan conquests; (*c*) Aramaic, the language of ancient Syria, which in Palestine also had taken the place of Hebrew as a spoken language before the Christian era; and (*d*) Assyrian, which has been recovered from countless inscriptions upon clay tablets found on the sites of ancient cities like Nineveh and Babylon. The different Semitic languages do not differ more from one another than do Romance languages like French, Italian, and Spanish. The most characteristic feature of the Semitic language is that, with rare exceptions, all roots have three consonants or semi-consonants, which, in combination with vowels, form series of words.

The verb system is much less perfectly developed than that of the Indo-Germanic languages.

Indo-European Languages. — To the Indo-European system belong a number of languages and dialects which fall easily into nine groups. These languages are widely spread, extending from India to Iceland in the Old World, and since the end of the fifteenth century having been disseminated over the whole of America, Australia, New Zealand, and the East Indies as the language of European conquerors or colonizers of those lands. The system has been called by other names, as Aryan, which is, however, more appropriately applied to the most easterly group of the languages. The name Indo-European is commonly used, but seems to imply that the languages are spoken only in India and Europe, which is inaccurate, as is also the notion that all Indian and European languages belong to this system. In Southern India the Dravidian languages, of which the chief representatives are Tamil and Telugu, are agglutinative languages, and therefore of a different type, while in Europe, Turkish, Hungarian, Finnish, and Lapp belong to an agglutinative system.

Parent-speech.—The languages belonging to this system are descended from an original language long since lost. Where this language was spoken it is difficult definitely to decide. The best authorities incline to the view that it was in the great plain between the Baltic and the Black Sea. The language was highly developed before the Indo-Germanic community broke up. Before the languages separated one from another this original speech had at least seven cases in the noun declension, besides the vocative, which is the bare stem. In the verb there was a very elaborate distinction of two voices—active and middle, of three moods—indicative, subjunctive, and optative. The imperative was to the verb what the vocative was to the noun, simply the bare stem, while the infinitive is in all the languages only stereotyped case forms from various noun stems.

The Nine Groups of the Indo-European System.—1. The first member of the nine groups into which this family of languages is divided is the *Indian*. The earliest representative of this is Sanskrit. The earliest literature belonging to the Indo-European family is contained in the hymns of the *Rig Veda*, some of which go back to 1500 or 2000 years B.C., while some authorities would put them much earlier. A further stage in the breakdown of the form system is seen in Prakrit, and later in Pâli, which stands in the same relation to Sanskrit as Italian does to Latin. Pâli was the language of the great Buddhist revival, which had spread over a large part of India by 270 B.C. The modern dialects of Northern India, Hindi, Bengali, &c., and the language of the Gipsies are still more decadent descendants of Sanskrit.

2. *Iranian*, including Zend (Old Bactrian), was the language spoken in ancient times in the eastern part of the Persian Empire. It is the language of the religion of Zoroaster, which still survives among the fire-worshippers of Eastern Persia and the Parsis of Bombay. Within Zend there is noticeable a difference of dialect between the hymns (*Gatha*) and the rest of the Zoroastrian literature, the hymns being more archaic than the rest, and standing in the same relation to the later Avesta that the *Veda* does to classical Sanskrit.

The Old Persian of the cuneiform inscriptions (see *Cuneiform Writing*) begins with the inscriptions of Darius Hystaspes (about 520 B.C.). These, and above all the great Behistun inscription engraved on the face of a precipitous cliff 300 feet from the ground, are the most important, but others of various dates exist down to about 350 B.C.

3. Proceeding westwards, the next member of the stock which we find is the *Armenian*. This language, which possesses a literature going back to the fifth century A.D., is so full of Iranian words that till 1875 it was looked upon as a branch of Iranian. It differs, however, from Iranian in preserving the original sounds.

4. More important in the history of the world is the next group—*Greek*. The earliest Greek writings preserved to us are the Homeric poems. The language of these poems, however, is clearly a literary language—Epic—and not the spoken dialect of a particular place. Owing to the geographical formation of Greece, the language was broken up into a multitude of dialects.

5. Next in order comes *Albanian*, the modern representative of the ancient Illyrian. This has only recently been recognized as a separate member of the system, its vocabulary being even more packed with foreign words than is Armenian. Latin, Slavonic, Greek, and Turkish have all contributed some elements. Its literature does not extend farther back than the seventeenth century.

6. *Italic*, or the dialects of Italy. These fall, on the one hand, into Latin and the little-known dialects of Falerii and Præneste; on the other hand, into Oscan, the language of the ancient Samnites and of Campania; the dialects of various smaller tribes, including the Sabines, Pelignians, &c.; and the dialect of Umbria, in North-Eastern Italy. Vulgar Latin was the parent of the Romance languages, which are: French, Italian, Spanish, Portuguese, Rhæto-Romanic or Roumansch (spoken in East Switzerland), Roumanian, and Provençal. The earliest inscriptions (one of a brooch found at Præneste in 1886, another on a broken pyramidal pillar discovered

during excavations in the Roman Forum in 1899) do not go farther back than the sixth century B.C. The classical period of the literature is comprised within the century preceding and the century following the birth of Christ. The later literature, however, is of great interest to the student of language.

7. *Celtic.* Here the ancient language of Gaul, of which some fragments remain. Welsh, Cornish, and Breton—the language of settlers from Cornwall in the ancient Armorica—form one group, while Irish, Scottish Gaelic, and Manx form the other. The oldest Runic, or Ogham, inscriptions go back probably to A.D. 500 or 600. In Irish and Welsh there is a large literature, beginning with the eleventh or twelfth century.

8. The *Germanic* or *Teutonic* dialects. The oldest literature in these is the fragmentary Gothic translation of the Bible made by Bishop Wulfila (Ulfilas) in the fourth century. The Norse, the earliest remains of which are the Runic inscriptions from Jutland and Schleswig, which date probably as early as the third or fourth century A.D., splits after the age of the Vikings into four dialects—Icelandic, Norwegian, Swedish, and Danish. Icelandic possesses the best early literature in any Germanic language. A third group of these dialects is the West Germanic, comprising Old English (Anglo-Saxon), Frisian, Low German, Low Franconian (whence Dutch and Flemish), and High German. The English settlers in Britain came from Friesland and the neighbouring coasts as far as Jutland, and in the fifth century A.D. ousted the Britons from the eastern side of England and drove them into the mountainous districts of the west.

9. The *Slavonic* group. This group falls into two sections: (*a*) the Baltic or Lettic, including Lithuanian and Lettish, which are still living languages, and Old Prussian; (*b*) Slavonic proper, which includes a great variety of dialects, the oldest literature existing in the Old Bulgarian or Old Church Slavonic.

Comparative Philology.—The evidence that all these languages are closely akin is to be found in the great number of words that they possess in common, in the similarity of their structure, their inflections, their manner of compounding words—in short, in their family likeness. This likeness can only be accounted for by supposing that these languages are all descended from one common language, the primitive Teutonic, which must have been spoken at a remote period by the ancestors of the present Teutonic peoples, there being then only one Teutonic people as well as one Teutonic tongue. In their earliest form, therefore, and when they began to be differentiated, these languages must have had the character of mere dialects, and it is only in so far as each has had a history and literature of its own that they have attained the rank of independent languages.

How remote the period may have been when the ancestors of the Teutons, the Celts, the Slavs, the Greeks, Romans, Persians, and Hindus were living together and speaking a common language is uncertain. Yet the general character of their language is approximately known, and philologists tell us with some confidence what consonant and what vowel sounds the Aryan parent-speech must have possessed, which were the forms of its inflections, and what, at the least, must have been the extent of its vocabulary, judging from the words that can still be traced as forming a common possession of the sister tongues of the family.

Grimm's Law.—In order to understand how it is that many words in the different Aryan tongues have the same origin, though superficially they may appear very different, it is necessary to know something of Grimm's Law. This law, which, like a natural law, is simply a statement of observed facts, is so named from the great philologist who first definitely laid it down as the result of observation and comparison of the relative linguistic phenomena. It concerns the so-called 'mute' consonants (*t*, *d*, *th*; *k*, *g*, *h* (*ch*); *p*, *b*, *f*), and takes effect more especially when these are initial. According to it, in words and roots that form a common possession of the Aryan tongues, being inherited by them from the parent-speech, where in English (more especially Anglo-Saxon) and in most of the Teutonic tongues we find *t*, *d*, or *th*, we find in Latin, Greek, and Sanskrit not these letters, but respectively *d* instead of *t*, an aspirated sound instead of *d*, and *t* instead of *th*. That is, an English *t* corresponds to a Latin, Greek, and Sanskrit *d*, as is seen in *tame*, compared with Lat. *domare*, Gr. *damaein*, Skt. *dam*, to tame; an English *d* corresponds to Latin *f*, Greek *th*, Sanskrit *dh*, as in Eng. *door*, Lat. *fores*, Gr. *thyra*, Skt. *dvara* (for original *dhvara*), a door; an English *th* corresponds to Latin, Greek, and Sanskrit *t*, as in *thin*, compared with Lat. *tenuis*, Gr. *tanaos*, Skt. *tanu*, from root *tan*, to stretch. If we next take the gutturals, we find that English *k* (or *c* hard), *g*, *h* correspond respectively in the above languages to *g*, *h* (*ch*, *gh*), *k*, as is seen in Eng. *kin*, Lat. *genus*, Gr. *genos*, Skt. *janas* (where *j* is for original *g*); Eng. *goose* (modified from original *gans*), compared with Lat. *anser* (for older *hanser*), Gr. *chēn*, Skt. *hansa*; Eng. *head* (A.-Sax. *heafod*), Lat. *caput*, Gr. *kephalē*, Skt. *kapala*. Similarly, *b* in English corresponds to *f* in Latin, *ph* in Greek, and *bh* in Sanskrit, as in *brother* = Lat. *frater*, Gr. *phratēr*, Skt. *bhratri*, Russ. *brat*, a brother; *f* in English to *p* in Latin, Greek, and Sanskrit, as in *father* = Lat. *pater*, Gr. *patēr*, Skt. *pitri*, father. Certain exceptions to the law are accounted for by a subsidiary law of more recent discovery than Grimm's Law, known as *Verner's Law*, and formulating certain facts connected with the original accentuation of Aryan words.

The Science of Comparative Philology.—The science of philology is of quite modern origin, being hardly, if at all, older than the nineteenth century. Speculations on language and its nature were indulged in by the ancient Greeks; but as the Greeks knew little or nothing of any language but their own, they had not sufficient materials wherewith to construct a science of language. In later times materials became more abundant, as scholars studied Hebrew, Greek, Latin, Arabic, &c.; but it was the introduction of Sanskrit to the Western world, and its observed similarity in many respects to Greek, that led to the establishment of comparative philology on a true scientific basis, an achievement which was largely due to the labours of Bopp, Pott, Schleicher, and other scholars. Yet though most valuable results have been attained and many languages have been studied and classified, much remains to be done, much remains uncertain and must always remain so. One great difficulty that the philologist has to grapple with is the want of historical documents to throw light on the history of the great majority of languages, as only a very few possess a literature dating from before the Christian era, and far the greater number have no literature at all.

A new school of philology arose between 1870 and 1880, and Osthoff and Brugman, Grassmann and Delbrück did valuable work, and discovered new laws, especially with regard to the original vowel system. It was proved that the three simple vowels in the Sanskrit and Gothic were not the only vowels in the original language. Whilst the old school of philologists in studying language had begun with the dead languages, the new school started with the study of living languages, and worked backwards to the dead languages. This school also introduced the study of *semantics* or *semasiology*, or the development of the meaning of words, the foundations of which were laid by Michel Bréal.

BIBLIOGRAPHY: J. Peile, *Primer of Philology*; A. H. Sayce, *Introduction to the Science of Language*; W. D. Whitney, *The Life and Growth of Language*; H. Paul, *Principles of the History of Language*; J. M. Edmonds, *An Introduction to Comparative Philology*; T. G. Tucker, *Introduction to the Natural History of Language*; L. Bloomfield, *An Introduction to the Study of Language*; A. Hovelacque, *La Linguistique*.

Philome'la, in Greek mythology, a daughter of Pandion, King of Athens, who being violated and deprived of her tongue by Tereus, the husband of her sister Procne, made known her wrong to the latter by embroidering it in tapestry. In revenge the sisters murdered Itys, the son of Procne by Tereus, and served him up to his father. Tereus pursued them, but they were changed by the gods into birds, Philomela and Procne into a nightingale and a swallow, and Tereus into a hoopoe.

Philopœ'men, ancient Greek statesman and general, born at Megalopolis, in Arcadia, about 252 B.C., died about 183. Having distinguished himself in war against the Spartans, he was, in 208 B.C., appointed commander-in-chief of the forces of the Achæan League. He organized the Achæan army, defeated and slew with his own hand Machanidas, tyrant of Sparta, and subsequently defeated Nabis, the successor of Machanidas. He induced the Spartans to join the Achæan League; but, soon becoming dissatisfied, they separated from the confederacy, and called in the Romans to their assistance. Philopœmen, as commander of the Achæans, declared war against Sparta, and, having taken the city, treated it with the greatest severity. The Romans, however, interfered, and Sparta was again admitted into the confederacy as an independent state. Messene now revolted, and Philopœmen, though broken by infirmity and disease, drove back the insurgents, but was afterwards taken prisoner, carried in chains to Messene, and compelled to drink poison.

Philos'ophy, as the term implies, means love of wisdom, the yearning and striving after knowledge. We are informed by Herodotus that Crœsus said to Solon: " I have heard that thou hast travelled over many countries philosophizing ", by which he meant that he tried to acquire knowledge. The word thus owes its origin to both an admission of ignorance and a desire for knowledge. Socrates called himself a philosopher in contradistinction to the Sophists, although he did not exactly mean that he was ignorant of the facts explained by them. What he really meant was that they pretended to know more than they really did, and that their knowledge had to be criticized.

Scope and Meaning of Philosophy.—Broadly speaking, philosophy is thought applied to the nature of the real world around us and to all its manifestations, both to the life in the vast universe of which we are a part and to the life within us. It differs, however, from pure science in many ways. In the first place, science deals with details, and is, so to say, departmental. Every science and every art is concerned with certain conceptions and assumptions; their sphere is limited by the boundary-line of the finite, and their data are taken from experience. Philosophy, on the contrary, inquires into the very essence of things, criticizes the very conceptions and assumptions of science, investigates the principles which lie behind the data of each science, and upon which the sciences establish themselves unquestionably. We thus speak of a philosophy of mathematics and of a philosophy of art, of a philosophy of religion and of a philosophy of history.

The business of philosophy is thus both to reflect and to criticize. Whilst each science is concerned only with its own branch of knowledge, philosophy deals with things as a whole, embracing the macrocosm and the microcosm. It endeavours to find answers to the questions: What exists? How did it come into existence? Why do we act thus and not otherwise? In what relation does an idea or an object stand to other ideas or objects? It is, however, a mistake to imagine that philosophy is something apart from real life, or that it only deals with the pale ghosts of conceptions, belonging rather to heaven than to earth. On the contrary, whilst it endeavours to *know*, independently of practical use or utility, to discover the reason and connection of things, the aim of philosophy is to find truth, expose error, shatter old creeds and ideals, and set up new ones to which humanity can cling. Philosophy is therefore not only critical, but also constructive. It explains the world and the meaning of life, and shapes human actions and human conduct. Its school is the world, its subject-matter is the phenomena of the universe, and its textbook is human reason.

The term philosophy has, however, not always been understood and defined in the same way by all philosophers. Originally it indicated simply the spirit of inquiry, and the early thinkers applied the term to the whole range of human knowledge of their period. It was the aggregate of all the sciences. Plato defined it as the acquisition of true knowledge, whilst Epicurus and the Stoics gave it a more practical turn. In the Middle Ages philosophy became an attempt to reconcile faith and reason. Bacon and Descartes looked upon it as the universal science, whilst for Locke it was an analysis of the human understanding. Kant, opposing both empiricism and dogmaticism, looked upon philosophy as "the legislation of human reason", or critical analysis.

The Problems of Philosophy.—The problems of philosophy, which thinkers of all ages have endeavoured to solve, have been numerous, but not always the same. This they could not have been. Human thought bears the impress of progress and evolution, and constantly old problems disappear, new ones taking their place. Scarcely has an answer been found to an old perplexing question when a new question arises. Mighty revolutions in the domain of human thought have solved old riddles, but new ones continually emerge on the horizon of human thought. The problems of philosophy are psychological, ethical, metaphysical, epistemological, and theological. In other words, they deal (1) with the science of mind, and with the phenomena of consciousness, with sensations, emotions and thoughts—reason and memory, association of ideas and language. (2) With the origin and source of our sense of morality, the end and purpose of human moral actions and conduct, the inner motives of human moral conduct, and the moral standard by which our actions are regulated. (3) With being *per se*, with appearance and reality, matter, and spirit. (4) With the question of the nature of knowledge, its origin, its validity, and its limits. (5) With the questions relating to the transcendent power behind the phenomena of nature, or the existence and attributes of God. According to the manner and method in which philosophers have endeavoured to solve these problems, numerous philosophical systems and schools have arisen, which will be referred to in the following section.

History of Philosophy.—The history of philosophy is the sum total of the fundamental conceptions, theories, and doctrines of the great philosophers of all ages, giving in chronological order their views of the world and their judgments of life. Without entering into the details of the philosophical problems discussed and investigated by philosophic thinkers, from Thales to Bergson, and from Anaximander to James, we will give in the following pages a brief historical outline of the principal features characterizing the various epochs of philosophic development. The history of philosophy can be divided into the following periods, each stamped with its own characteristic feature:

1. The philosophy of the Greeks.
2. Hellenistic-Roman philosophy.
3. Mediæval philosophy.
4. Modern philosophy.

(1). Although Greek thought had been influenced by the civilization of the East, and especially of Egypt, the origin of philosophy is a result of the Greek spirit. Whilst the Orientals collected a mass of information, they, as a rule, sought that information merely for the purpose of practical needs. The Greeks, however, were the first to develop the scientific and independent work of intelligence, and to seek knowledge for its own sake. "Supported on the shoulders of Egypt and Babylon", writes Gomperz (*Greek Thinkers*), "the genius of Greece could take wing without check or restraint, and venture a flight that was to lead it to the highest attainable goals." Theirs is the merit of the scientific development of philosophy, their characteristic trait being, according to Plato, investigation. The three periods of Greek philosophy are: the cosmological, the anthropological, and the systematic.

The first Greek philosophers were physicists, and their interests were centred in astronomical, geographical, and physical questions. They at first tried to find formulæ for the universal mutability of things, and their theories were an attempt to solve the question of change in the universe. They formulated an answer to the question: "What is the original cause of things which outlasts all temporal change, and what is the nature of this cause, or of this cosmic matter?" From nature-knowledge Greek philosophers then turned their gaze and investigations to human activities, man's ideation and will, and the manner in which ideas and volitions arise. They also investigated the question whether there is anything universally valid, true and right and good in itself, independently of individual opinions. According to Aristotle, the philosophers had sought to find the material and the formal principles of all things. Whilst, however, the cosmological and anthropological philosophers had only tried to find a solution to a limited number of questions, the systematic philosophers, like Plato and Aristotle, investigated the entire compass of scientific problems, and gave the world all-embracing systems, and a crystallization of the entire content of Greek thought. Thus the first problem of Greek philosophy was to explain the enigma of external nature, to solve the problem not of the soul but of the world. Thales (about 600 B.C.) stands at the head of the Ionian school, which, with the Eleatic school, was the chief representative of speculative thought in pre-Socratic times. The material principle sought by the Ionian school was assumed to be water by Thales, a primitive infinite but undetermined matter by Anaximander, and air by Anaximenes. The Pythagoreans substituted a symbolic principle—number—for the sensuous principle; but the Eleatics, transcending alike the sensuous principle of the Ionians and the quantitative principle of the Pythagoreans, conceived of pure being as the one sole substance, the phenomenal world being viewed as unreal. The three great philosophers of this school are its founder Xenophanes, Parmenides, and Zeno. The transition from abstract to concrete being, from the Eleatic principle of unity to the world of phenomena, was attempted by Heraclitus (about 520 B.C.), who asserted for an absolute principle the unity of being and non-being, or becoming. Empedocles (440 B.C.) advanced the theory that matter was the principle of permanent being, while force was the principle of movement. The two moving forces in his system were love and hate. According to the Atomists, on the other hand, who are represented by Leucippus and Democritus (450 B.C.), the moving forces became an unintelligible necessity giving form to the world. Anaxagoras (born about 500 B.C.) asserted that reason was the principle, and his mere expression of a spiritual principle is sufficient to mark an era in philosophy. In the hands of the Sophists this principle, in the sense of individual reason, became the occasion of their denial of all objective reality. In Socrates (470–399 B.C.), who united scientific method and a high ethical and religious spirit, the destructive teaching of the Sophists found its keenest opponent.

The Cynics, Cyrenaics, and Megarians severally professed to regard Socrates as their founder, the Cynics, however, defining the end of action as self-sufficiency, the Cyrenaics as pleasure, and the Megarians as reason. With Plato (427–347) philosophy lost its one-sided character. He was professedly a disciple of Socrates, but his system of idealism is his own.

Plato's ideal theory is criticized by Aristotle for giving no real explanation of the connection between the phenomenal and the ideal. In Aristotle's own system, instead of beginning with the general and the absolute, as Plato had done, he begins with the particular and individual. His whole philosophy is a description of the given and empirical, and his method is induction. The three schools of Greek philosophy which followed the systems of Plato and Aristotle, and which mark the declining days of Greece, are those of the Stoics, Epicureans, and Sceptics.

(2). The fundamental character of the Hellenistic-Roman period is erudition rather than speculation. It was a new departure, due to the state of general culture and to the new turn Greek political and social life had taken. Coming under the Roman sway, Greek thought underwent a complete change, and national religion and customary morality were shaken to their foundations. Philosophy assumed a practical aspect, and "men sought" as Windelband says, "to find in philosophy a compensation for religious faith". The Romans, too, being a practical people, were not greatly interested in purely theoretical problems, and it was a complete art of living, a guide for life, that they sought in philosophy.

Such were the tendencies of the Stoic and Epicurean schools. Hellenistic-Roman philosophy had therefore an ethical stamp.

On the other hand, the civilization of the Roman Empire, as time went on, exhibited extreme contrasts in daily life, and a sense of injustice and feeling of revolt took hold of many millions. Luxury and misery, abundance and starvation were witnessed side by side, and the feeling of discontent and dissatisfaction stimulated a craving and a hope for some future compensation. Salvation was sought in a world beyond the senses. Political questions were relegated to the background, and philosophy was permeated by a religious spirit; it became mystical and theosophical. The systems of stoicism, epicureanism, and scepticism were followed by those of Neo-Platonism, gnosticism, and Judæo-Hellenic philosophy.

(3). The chief aim of Christian philosophy was, broadly speaking, the definition and justification of Christian doctrines. Its task was to show how the truths of Christianity were acceptable to reason. The whole course of Christian philosophy may be divided into two great periods. The first, the Patristic period, began with the opening of the Christian era and lasted until the age of Augustine (354–430), whilst the other extended from the ninth to the fifteenth century. The latter period is termed the Scholastic.

" Scholasticism ", wrote Hegel, " is not a fixed doctrine, like Platonism or scepticism, but an endeavour to propound theology scientifically." It was an attempt to reconcile the spheres of reason and faith. Whilst Patristic philosophy is the outcome of classical antiquity only, Scholastic philosophy may be said to be the result of a new civilization, that of the Germanic and Neo-Latin worlds.

(4). The fourth period, that of modern philosophy, begins with the Renaissance and continues to the present time. The dawn of modern philosophy was brought about by two great historical movements—the Renaissance, or the Revival of Learning and of classical antiquity, and the Reformation. On the one hand, the mediæval mind, weary of dry scholasticism, turned to Greek culture and Greek thought, whilst, on the other, the Reformation had stimulated a revolt against the authority of the Church and fostered the development of individual judgment. Modern philosophy, therefore, is distinguished by a spirit of individualism and independence. It is a transition from faith to reason. It has been rightly defined as ' Protestantism in the sphere of the thinking spirit '. It was both naturalistic and individualistic in its tendencies. First appealing to individual reason, setting it up as the final court of judgment, and submitting everything to the test of reason, it gradually began to call reason itself into question. It evolved from rationalism to empiricism, criticism, scepticism, positivism, and pragmatism.

Bacon and Locke on the one hand, and Descartes on the other, stand respectively at the head of the two systems—empiricism and idealism—which begin modern philosophy. Bacon created no definite system of philosophy, but gave a new direction to thought, the empiricism which he founded finally developing into scepticism. The system of Descartes was opposed by Gassendi, and received modifications at the hands of others, especially Malebranche. The most important successor, however, of Descartes was Spinoza, who reduced the three Cartesian substances, the ground of all things, that excludes from itself all negation or determination, and is named God or Nature. Locke (1632–1704) is regarded as the father of modern materialism and empiricism. As occupying the general position of Locke, mention may be made of Isaac Newton, Samuel Clarke, William Wollaston, the Earl of Shaftesbury, and Francis Hutcheson. The philosophy of Locke received a further development in France, where Condillac sought to explain the development of humanity by the simple development of the sensations. Then followed the materialism of Helvetius, d'Holbach, La Mettrie, and others, including several of the Encyclopedists. In opposition to this materialistic tendency arose the idealism of Leibnitz and Berkeley. The theories of Leibnitz were systematized by Wolff, and from his time to Kant German philosophy assumed no new standpoint. Berkeley (1684–1753), founding on Locke's principle that we are percipient of nothing but our own perceptions and ideas, argued that the existence of bodies out of a mind perceiving them is impossible, and a contradiction in terms.

Granting the premises of Berkeley, his conclusions could not be refuted; but it was reserved for Hume to trace out the ultimate consequences of the Cartesian and Lockian philosophy, and thus, though unintentionally, by a sort of *reductio ad absurdum*, to produce the great metaphysical revolution of which Reid and Kant were the first movers. The Scottish or ' commonsense ' school of philosophy, with Reid (1710–96) at its head, has the merit of having first strongly inculcated the necessity of admitting certain principles independent of experience as the indispensable conditions of thought itself. Dugald Stewart, with some deviations, followed in the track of his master; but Thomas Brown departed on many points of fundamental importance from Reid's philosophy. The same occasion that gave rise to the Scottish school also produced the philosophy of Immanuel Kant. Kant (1724–1804), who may be justly regarded as the father of the philosophy of the nineteenth century, sought to bring together into unity the one-sided endeavours of his predecessors in the Realistic and Idealistic schools. He took up a critical standpoint, and from it instituted an inquiry into the origin of our experience or cognition. One of the ablest opponents of the Kantian philosophy, Jacobi, took the standpoint of faith in opposition to that of criticism, in order to give theoretic certainty to the postulates of the practical reason. In the hands of Fichte the critical idealism of Kant becomes absolutely subjective idealism. " All that is, is ego "; this is the principle of the Fichtian system:

the world is merely phenomenal, consciousness is a phenomenon, perception is a dream. Fichte's subjective idealism found its continuation in the objective idealism of Schelling and the absolute idealism of Hegel. Schelling (1775–1854) started from the ego of Fichte, and by a combination of the doctrine of the ego with Spinozism transformed it into the system of identity.

Hegel (1770–1831), developing this principle of identity, created the system of absolute idealism. In his philosophy he aims at elevating consciousness to the standpoint of absolute knowledge, and systematically developing the entire contents of this knowledge by means of the dialectical method. Schleiermacher (1768–1834) promulgated an eclecticism to which Plato, Spinoza, Kant, and Schelling were the chief contributors. Schopenhauer (1788–1860) developed a doctrine which may be described as a transitional form from the idealism of Kant to realism. In opposition to Fichte's subjective idealism, and to Schelling's renewed Spinozism, Herbart (1776–1841) developed a philosophic scheme on the basis of the realistic elements in the Kantian philosophy, as also of Eleatic, Platonic, and Leibnitzian doctrines. After the death of Hegel, Feuerbach, Richter, Strauss, Arnold Ruge, and others developed, in an extreme manner, Hegelian thought. Beneke (1798–1854), in opposition to Hegel and to Herbart, developed, on the basis of certain doctrines of English and Scottish philosophers, a psychologico-philosophical doctrine, resting exclusively on internal experience. During recent years in Germany Hegelianism has counted more adherents than any other system. Next to it has stood the Herbartian school; and more recently the modification of systems through a return to Aristotle or Kant, and the study of philosophy upon its historic side, have occupied the larger number of minds. The teachings of Schopenhauer and Beneke, as also of Krause, Baader, Günther, and others, have been reproduced and modified by individual disciples.

Materialism is represented by Vogt, Moleschott, and Büchner, and sensualism in Czolbe and others. While resting in part upon the basis of the doctrines of earlier thinkers, Trendelenburg, Fechner, Lotze, and others have advanced in new and peculiar paths. The doctrines of H. Ritter, Carus, Weisse, Friedrich Nietzsche, and others also merit attention. Though philosophy of late years has nowhere been cultivated to such an extent as in Germany, other countries have made no inconsiderable contributions to philosophical science. In France two philosophical tendencies opposed the sensualism and materialism so universal at the beginning of the nineteenth century. Of these one was theosophical, and the other found expression in the Eclectic and Spiritualistic school which was founded by Royer-Collard as the disciple of Reid, which was further built up by Cousin, who incorporated into its body of doctrines a number of German philosophies, and in which the Cartesian tradition was renewed. Less brilliant than Cousin, but possessing no small merit as a thinker, Jouffroy attempted to unite the philosophy of his predecessor, Maine de Biran, to that of the Scottish school, and became associated with the Spiritualistic school, to which also belong the names of Garnier, Janet, Rémusat, Franck, Jules Simon, and others. This school has contended valiantly against the pantheistic tendencies of the age. Independent systems are those of Pierre Leroux, Lamennais, Jean Reynaud, and Buchez. Materialism has its supporters in Cabanis, who sees in thought only a secretion of the brain, Broussais, Gall, and others. Positivism, founded by Auguste Comte, numbers not a few followers on the Continent and in England.

In Great Britain the Scottish school had later exponents in Sir James Mackintosh (1765–1832) and Sir William Hamilton (1788–1856), the last-named being, moreover, largely influenced in some points of his psychology by Kant. Our knowledge, according to Hamilton, is conditioned by our faculties; we have no faculty for comprehending the infinite and absolute; and all human philosophy, therefore, treats only of the relative and phenomenal. The absolute, as unknowable, is transferred from the province of philosophy to that of religion, from reason to faith. Mansel and McCosh may be mentioned as disciples of Hamilton. Ferrier (1808–64) assumed a polemical attitude towards the common-sense school in respect of its fundamental peculiarity, as he viewed it, of absorbing philosophy into psychology, as well as on minor details of the system. The associational psychology of Hartley, Priestley, and Darwin has its representatives in the nineteenth century in James Mill (1773–1836) and his son John Stuart Mill (1806–73), who make the principle of association the sole explanation of psychical phenomena. Bain, Grote, and Lewes follow more or less in the same track. Herbert Spencer attempted to widen the psychological principles of the associational psychology into a universal doctrine of evolution, which should not only provide for the evolution of all forms of being, but also of the fundamental principles of philosophy itself. T. H. Green, J. and E. Caird, and W. Wallace have been exponents of the Hegelian philosophy. In America, as in England, philosophy has been prosecuted more as an applied science, and in its special relations to morals, politics, and theology. Speculation there has been widely influenced by Scottish philosophy.

The philosophy of the last fifty years is characterized by a growing demand for a scientific world-theory. Criticism has become a vital factor, and the problem of the ability of the human intellect to construct a world-theory has again been raised. There is a reaction against idealism and rationalism, and a shifting of the interest from universals to particulars, from logic to intuition, from intellect to the will. Some modern philosophers maintain that the human intellect is unable to solve the world-riddle, that metaphysics is impossible, and that knowledge is limited to the study of facts of experience, or is only an instrument in the service of the will to live. Others think that the source of knowledge lies not in the intellect but in feeling, belief, or intuition. A prominent place in the philosophy of the present day is also occupied by the problem of values, and some philosophers are becoming convinced that the value of existence cannot be established purely theoretically. Among recent philosophers of note we may mention: Andrew Seth, D. G. Ritchie, A. J. Balfour, W. S. Jevons, Leslie Stephen, James Sully, and H. Sidgwick in Britain; Paul Janet, E. Boutroux, A. Fouillée, and Henri Bergson in France; and F. Paulsen, Kuno Fischer, Herman Cohen, and R. Eucken in Germany.

BIBLIOGRAPHY: W. Turner, *History of Philosophy*; H. Höffding, *A Brief History of Modern Philosophy*; R. Falckenberg, *History of Modern Philosophy*; W. T. Marvin, *The History of European Philosophy*; F. Thilly, *History of Philosophy*; A. Schwegler, *Handbook of Philosophy*; A. Windelband, *A History of Philosophy*; P. Janet and G. Séailles, *Histoire de la philosophie*; B. A. W. Russell, *The Problems of Philosophy*; A. S. Rappoport, *A Primer of Philosophy*.

Philos'tratus, Flavius, Greek sophist, born at Lemnos about the middle of the second century of our era. He taught rhetoric at Athens and subsequently at Rome, where he obtained the favour of the Emperor Septimius Severus, and he accompanied the Empress Julia Domna in her travels. His principal work is his *Life of Apollonius of Tyana*, supposed by some critics to be written as a counterblast to the Gospels. His other works are the *Heroica*, a history in dialogue of the heroes of the Trojan War; *Lives of the Sophists*; and *Letters*.

Phlebi'tis is inflammation of the walls of a vein, and since such inflammation almost always leads to clotting of the blood inside the vein (venous thrombosis), the two conditions should be considered together. The chief causes that bring about these conditions are injury to a part, after-effects of an operation, infection spread from some other region of the body, severe debility and cachexia, and certain infectious fevers. Various veins of the body may be affected, and when superficial, can be felt as a firm cord under the skin. When deep, the thrombosed vein cannot be palpated, but there is much tenderness and pain in the region. The most frequently affected veins are those of the thigh, and a form of venous obstruction in the thigh due to thrombosis, known as phlegmasia alba dolens (white leg), occurs in women during the puerperium, and causes much swelling of the limb. Recovery usually follows in simple cases, but great care should be taken on account of the risk of a portion of the clot becoming detached and carried in the circulation to the lungs, where it causes an embolism.

Rest in bed for three to six weeks until all pain over the course of the vein has disappeared is imperative, and all sudden movements and exertion should be avoided.

Phlebot'omy, or **Venesection**, is the opening of a vein to let a certain amount of blood out. As a method of treating various diseases it has been used by the medical profession from earliest times, and was so widely practised in the eighteenth century and the beginning of the nineteenth that it has to-day fallen into almost complete disuse as a reaction to the former abuse. There are certain conditions when it can be employed with benefit, as when there is engorgement of the veins as a result of failure of the heart, especially in plethoric subjects, also in cases of high blood-pressure, Bright's disease, and in toxæmic states like uræmia, eclampsia, and diabetic coma. The method of cupping (q.v.) and the application of leeches produce similar, but slower, effects in these conditions.

Phleg'masia is a diffuse inflammation of the tissues. Phlegmasia alba dolens (milk leg) is an inflammation of the leg in women during the puerperium, due to phlebitis (q.v.).

Phlœm, or **Bast**, in botany, that part of the conducting or vascular tissue which serves for the transmission of proteins, sugars, &c., i.e. of the ' plastic ' materials manufactured principally in the leaves. Its most important constituents are the sieve-tubes (q.v.); fibrous elements (bast fibres) are also frequently present, e.g. in the lime.

Phlogis'ton, an element or principle supposed by Stahl (1697) to exist in all inflammable substances, and to be separated from them by the process of combustion. The phlogiston theory held the field for nearly a hundred years. The very ablest investigators, such as Cavendish, Black, Scheele, and Priestley, were firm believers in the doctrine. Priestley, when he discovered oxygen, called it dephlogisticated air. Nitrogen he called phlogisticated air. When an ore was smelted, it was supposed to absorb the phlogiston evolved during the combustion of the fuel in the furnace, and so to be converted into the metal. The metal itself, again, when heated, was dephlogisticated and converted into a 'calx'. The difficulty about the calx—the oxide, as we should now say—being heavier than the original metal was either ignored or explained by regarding phlogiston as a 'principle of levity'. Phlogiston was, in fact, a sort of negative oxygen, oxygen and phlogiston being related in much the same way as positive and negative electricity. The death-blow to the theory was given by Lavoisier (1775), who was the first to propose what everybody nowadays believes to be the correct description of combustion. Priestley held to the old doctrine to the last. See *Chemistry*.

Phlox, a genus of perennial herbaceous plants of the nat. ord. Polemoniaceæ, natives for the most part of North America, though some of the species are to be met with in Asia. The flowers, which are favourites in gardens, are of a purple or violet colour, more rarely white or red, with a salver-shaped corolla, and a narrow subcylindrical tube longer than the calyx. The trailing kinds are excellent for rock-work.

Phlox

Pho'cion, Athenian general and statesman, supposed to have been born about 402 B.C. According to Plutarch, he was nominated commander forty-five times without once applying for the office. He always led a simple life, and cultivated his small farm with his own hands. As the leader of the conservative or aristocratic party he opposed Demosthenes on the question of war with Philip of Macedon. He subsequently condemned the confederacy against Alexander the Great, and, after Alexander's death (828 B.C.), the war with Antipater. On each occasion Phocion was employed to make terms with the victorious Macedonians. In 818 Phocion was accused of treason for allowing Polysperchon to occupy the Piræus, and condemned to drink the hemlock. His remains, however, were shortly afterwards buried at public expense and his accusers punished.

Phocis (Gr. *Phōkis*), a division of ancient Greece, on the north side of the Gulf of Corinth, between Bœotia on the east and Doris and the *Locri Ozolæ* on the west. The principal rivers were the Cephissus and Plistus, and the principal mountain Parnassus, on which was situated Delphi with its celebrated oracle. The country is mountainous and unproductive, the valley of the Cephissus being almost the only fertile tract in it. The Phocians were an industrious people, and subsisted chiefly by agriculture. They were distinguished for their bravery, of which they gave signal proof in the war with the Thessalians, and in the Persian and Peloponnesian Wars. The Phocians were the cause of the *Sacred War*, so destructive to Greece, and shared the fate of their countrymen after the battle of Chæronea (388 B.C.).

Phœnicia, a country on the coast of Syria, bounded on the east by Mount Lebanon. The Greeks and Romans knew it as the Region of Palms, or 'the country where the palm grew'. Phœnicia proper was a tract of country stretching along the eastern shore of the Mediterranean, not much more than 28 miles in length, and little more than 1 mile in average breadth, Sidon being situated near its northern, and Tyre not far from its southern boundary. In its widest sense Phœnicia seems to have meant the whole seaboard from the Gulf of Issus to the southern desert, but generally it was regarded as beginning at the north with the Island of Aradus, and extending south to the town of Dora, below the promontory of Carmel. The country is watered by several streams flowing from Lebanon to the sea, and is fertile in timber, corn, and fruits. Besides the cities of Sidon and Tyre, Phœnicia was anciently studded with numerous smaller towns, forming almost an unbroken line along the coast. Among these towns were Arvad, Arka, Tripolis, Berytus, and Sarepta. The Phœnicians, like the Jews, were Semites, being derived from the Aramæan wave of immigration, which formed permanent settlements in Northern Syria. Their immigration to the coast of the Mediterranean must have taken place about 2500 B.C. or earlier. The settlement of Israel in Canaan did not produce any great or permanent change on Phœnicia. The tribes of Naphtali, Asher, and Dan, to which it was assigned, did not conquer Phœnicia, but occupied only a small portion of it; and the subsequent relations of Israel and Phœnicia were for the most part those of amity, intercourse, and reciprocal advantage. The wealth and power of the Phœnicians arose from their command of the sea, and it was their policy not to provoke any of the nations to the east of them, and not to quarrel unnecessarily with Israel, which was their granary. The relation between Hiram and David was probably but a sample of such international treaties and intercourse. After the division of the Hebrew kingdom Phœnicia would naturally cultivate alliance with the Ten Tribes nearest to it, and Ahab married a Phœnician princess. The wealth and commerce of the country had brought art and refinement, but effeminacy and licentiousness sapped the power of self-defence. A rich and unwarlike people could not but lure the conquerors to an easy prey, and the country was thus successively incorporated in the Assyrian, Babylonian, and Persian Empires, although the cities retained more or less their independence. It was next conquered by Alexander the Great, and henceforth simply formed part of Syria.

Constitution and Government.—As was the case in Canaan at the invasion, each Phœnician city was governed by a king or petty chief. A powerful aristocracy existed in the chief towns, and there were also elective magistrates, called by the Romans *suffētes*, a disguised form of the Hebrew *soffet*. Sidon, and afterwards Tyre, exercised a hegemony over the other states. The relation of Phœnicia to her colonies does not seem to have been very close. Their religion, however, bound the mother country and the colonies in a common worship. Carthage often sent presents to the chief Phœnician god; so did Gades and other settlements.

Commerce.—From a very early period the Phœnicians occupied themselves in distant voyages, and they must speedily have acquired a style of substantial shipbuilding. The ‘ ships of Tarshish ’ became famous, and Xenophon passes a high eulogy on a Phœnician ship. They were skilled in navigation and the nautical applications of astronomy. Lebanon supplied them with abundance of timber, and Cyprus gave them all necessary naval equipments, from the keel to the top-sails. In the reign of Pharaoh-Necho these daring navigators even circumnavigated Africa, and the Phœnicians furnished Xerxes with 300 ships, which took part in the battle of Salamis. The commerce of Tyre reached through the world. It traded in the produce of the whole known world, the spices and stones of Arabia, the myrrh and frankincense of Sabæa, the linen and corn of Egypt, the ivory and ‘ bright iron ’ and ebony and cotton fabrics of India, and the tin from Cornwall and Devonshire. Fishing was also an important industry, and the Tyrians sold fish in Jerusalem. The Phœnicians excelled in the manufacture of the purple dye from the shell-fish *murex*, abundant on its coasts. The glass of Sidon was no less famous than the Tyrian dye. Phœnicia produced also articles of silver and gold as well as of brass, and Homer describes Sidon as abounding in works of brass; its inhabitants were also skilled in architecture and in mining. The *Maabed* of Amrit, or Marathus, and two other similar shrines were discovered by Renan. The two famous pillars of the temple of Jerusalem, Jachin and Boaz, and the altar of gold were works of Phœnician artists.

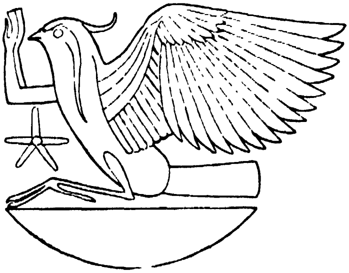
Colonies.—The maritime knowledge and experience of Phœnicia led to the plantation of numerous colonies in Cyprus, Rhodes, and the islands of the Ægean—the Cyclades and Sporades—in Sicily, in Sardinia, the Balearic Islands, and in Spain. The most celebrated of the Phœnician colonies, however, was Carthage, in Northern Africa, which extended its sway over the Spanish peninsula and disputed with Rome the supremacy of the Mediterranean. They purchased slaves from the northern shores of the Black Sea, and they also kidnapped and sold the children of Israel—a practice which brought upon them the denunciations of the prophets, and a just retaliation was predicted to fall upon them.

Religion.—The religion of the Phœnicians was a species of nature-worship, the objects of adoration being the sun, moon, and five planets; or in another form it was the worship of male and female reproductive powers—the former represented as Baal and the latter as Baalith, Ashtoreth, or Astarte. The god called El, a sort of Phœnician Cronos or Saturn, resembling the Moloch or Milcom of the Ammonites, had human sacrifices offered to him. Marine deities must have held a prominent place in their pantheon—deities corresponding to the Greek Nereus and Poseidon, which last was worshipped at Berytus. In the oldest temples there were no images, but there were rude fetishes—conical or oblong stones, possibly aerolites ‘ fallen from heaven ’, and fossil belemnites.

Language.—The language of Phœnicia belonged to the Hebrew-Phœnician division of the Semitic languages, representing in general an archaic stage of Hebrew and Moabitic. As Phœnician spread over the Punic colonies, the diffusion gave rise to variations both of dialect and script. The Phœnician alphabet, derived from the South-Arabian, is the ancestor of the Græco-Roman alphabets. The names of the so-called Cadmæan letters of the Greek alphabet have no meaning in Greek, but have each a significance in Hebrew and Phœnician. Thus *aleph* means an ox, *beth*, a house, *gimel* or *gamal*, a camel, &c. The sources of our knowledge of Phœnician are the transliteration of Phœnician phrases in the *Pœnulus* of Plautus, proper names and words found in the Old Testament, and the numerous inscriptions on tombs, votive tablets, and coins found in many places in Cyprus, Malta, Sidon, Sicily, Sardinia, and Africa. The longest of the inscriptions are those found upon the sarcophagus of King Eshmunazar, King of Sidon, discovered in 1855, and now in the Louvre; on a tablet discovered at Marseilles in 1845; and another found at Larnaka in 1879.

BIBLIOGRAPHY: G. Rawlinson, *History of Phœnicia*; N. Davis, *Carthage and her Remains*; Renan, *Mission de Phénicie*; Movers, *Die Phœnizier*; Schroeder, *Die phœnizische Sprache*; G. A. Cooke, *Textbook of North-Semitic Inscriptions*.

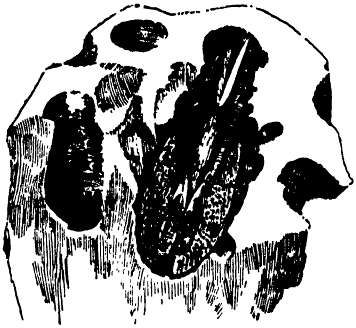
Phœnix (Gr. *phoinix*), a fabulous Egyptian bird, about the size of an eagle, with plumage partly red and partly golden. Of the various stories told of it by Herodotus and others the most popular is to the effect that the bird, at an age of 500 years, conscious of its approaching death, built a funeral pile of wood and aromatic gums, which it lighted with the fanning of its wings, and rose from the flames with a new life. It symbolized the morning sun rising out of the glow of dawn, and was looked upon by the Egyptians as the sacred bird of the sun-god Ra.



Phœnix

From an Egyptian wall-painting (after Wilkinson)

Pholas, a genus of marine bivalve molluscs, forming the type of the family Pholadidæ, in which the shell gapes at both ends. The shell, which is of thin white texture, is studded over on its outer surface with numerous rasp-like prominences, by means of which the animal excavates burrows in wood, rocks, indurated clay, &c., maintaining communication with the outer world by means of long breathing-tubes or siphons with fringed edges. They are popularly known as ' piddocks ', and are eaten on many parts of the British coasts. The common species is the *Pholas dactylus*; and the *P. candida*, *P. parva*, and *P. crispata* are also found in Britain. These molluscs appear to possess the power of emitting a phosphorescent light, *P. dactylus* being specially noted on this account.



Pholas dactylus

Phoma, a genus of Fungi Imperfecti, section Sphæropsidiaceæ, including several parasitic species, the best-known being *P. sanguinolenta*, which attacks the carrot, damaging the shoots and destroying the bloom, so that infected plants set no seed.

Phonet'ics (Gr. *phonē*, voice), the science of speech sounds and art of pronunciation, is that part of language study which deals with articulate sounds uttered by the human voice or used in a particular language. It not only ascertains the mechanism of voice production, investigates the structure of the various organs both producing and perceiving sounds, but also deals with the representation by alphabetical characters of the vocal sounds employed in a language. It is thus a science related to physics, as it is concerned with the acoustic analysis of sound, to physiology, as it investigates the functions of the organs producing sounds, and to philology or linguistics, as it deals with the elements of language. Phonetics deals not only with the mechanism of speech and the classification of sounds, but also with accent, stress or emphasis, tone of voice, and the quantity or duration of a sound. The science of phonetics is important, nay necessary, for the theoretical understanding and practical acquisition of a foreign language, and also for the study and correct pronunciation of one's own mother tongue.

The Mechanism of Speech.—Speech is the result of breath expelled by the lungs and modified in the throat and the mouth, and in the production of speech sounds machinery of a somewhat complicated kind is employed. The lips, the teeth, the tongue, the gums, and the palate (both hard and soft) take part in the operation of producing speech sounds. Most important of all are the vocal chords, pieces of membrane attached to each side of a cartilaginous box (the larynx) in the throat. The vibration of the edges of these chords when stretched tight, so as to leave only a narrow slit between them, is produced by the expiration of the breath. The sounds called vowels are produced by the vibration of the vocal chords, and are distinguished one from another by the position of the tongue and the shape of the mouth cavity. Thus, for the production of *a* (pronounced as *ah!*) the tongue lies low in the mouth, but rises somewhat at the back; for *o* the lips are rounded; for *i* (pronounced as *ee* in *seen*) the upper surface of the tongue is approached to the roof of the mouth behind the teeth, while the jaws are not so wide apart as for *a*. For *u* the lips are protruded as well as rounded; *e* (pronounced as in *red*) occupies a position between *a* and *i*. For the pronunciation of *p*, *t*, *k* (pronounced as *ip*, *it*, *ik*) it will be found that the mouth passage is entirely closed for a brief space by the lips for *p*, by the tongue against (in English behind) the teeth for *t*, against the palate for *k*, while in their production the vocal chords do not vibrate. The sounds *b*, *d*, *g* (in *gig*) differ only from *p*, *t*, *k* in being produced with vibration of the vocal chords. In producing all these sounds the breath is kept from passing through the nose. If the nose passage is left open, we produce, instead of *b*, *d*, *g*, the sounds *m*, *n*, *ng* (in *sing*). These last, as the nose is open, are called *nasal*, and are continuous sounds, that is, can be prolonged till the breath is exhausted.

Sonants and Consonants, Vowels and Semivowels.—Old phoneticians divided the alphabet into *vowels*, meaning sounds capable of being produced alone, and *consonants*, or sounds incapable of being so pronounced. This classification, however, has been found to be scientifically inexact. In words like *bosom*, *arbre*, *Handel*, the liquids *m*, *r*, and *l* form syllables in themselves, and we thus see that some consonants are capable of syllabic value. The modern classification, therefore, is into *sonants* and *consonants*, the first including all those sounds which are not serving in consonantal function, whether vowels or not. In other words, sonants are "accent-bearing sounds or syllable-forming, including both vowels and consonants". The distinction between vowels and consonants proper lies in the fact that the former consist of a vibration of the vocal chords, modified in the pharynx by the tongue and the soft palate without audible friction, whilst the latter are the result either of audible friction (*s*), or of the stopping of breath in some parts of the mouth or throat (*t*). "In the vowels the primary element is the action of the glottis, whilst the configuration of the throat or the mouth is of secondary importance; in consonants the reverse is the case" (J. M. Edmonds, *An Introduction to Comparative Philology*, p. 20).

According to the various principles of (1) their kind of articulation, (2) the degree of openness of the vocal passage, and (3) the place of articulation, or the point at which stopping or friction takes place, consonants are capable of various cross-classifications. They are classified (i) as voiced (*g*, *d*, *b*, *v*) and voiceless (*k*, *p*, *t*, *f*): (ii) as (1) spirants or open consonants (*s*, *z*); (2) stops or shut consonants, sometimes called mutes (*t*, *d*); (3) nasals or nose consonants (*n*); (4) liquids (different varieties of *l*); and (5) trilled consonants (different varieties of *r*): (iii) according to the place of their formation, as (1) velar consonants (also called guttural, in which the soft palate and back of the tongue are mainly concerned), as *c* in *cat*, *ch* in *loch*; (2) palatal or front consonants, formed by a narrowing between the tongue and the hard palate, as *k* in *kit*, *king*, *give*; (3) cerebral consonants or sibilants, formed by the blade of the tongue and the front of the hard palate, as *s* in *pleasure*, *sh* in *ship*; (4) dental consonants or teeth-roof consonants, in which the tip of the tongue touches or closely approaches the upper teeth, as *t* and *d*; (5) interdental consonants, as *th* sounds in English; (6) labials, formed by the action of the lips, as *p*, *b*, *w*; and (7) labiodentals, formed by the contact of the lower lip with the upper teeth, as *f*, *v*. Vowels are modified according to the vertical or horizontal positions of the tongue and the various other modifications of the organs of speech, and authorities count not fewer than seventy-two varieties. They are divided into low, mid, or high; front, mixed, or back; round or unround; and narrow or wide.

Besides vowels and consonants there are also sounds called diphthongs, or combinations of two sonants, glides, or transitions of sounds, and aspirates. Different languages sometimes make finer distinctions between the sounds, such as the dentals, produced against the sockets (*alveoli*) of the teeth, and called *alveolar*, and the genuine dentals. In the original language from which English is descended we distinguish the palatals, produced farther forward in the mouth as compared with other gutturals, which, being supposed to be produced against the *velum*, or soft palate, are called velar. It is the task of philology to ascertain for the earlier forms of language what were the exact sounds then existing, the written forms of any language giving but the most imperfect clue to the actual sounds.—BIBLIOGRAPHY: H. Sweet, *A Primer of Phonetics*; J. M. Edmonds, *An Introduction to Comparative Philology*; L. Soames, *Introduction to English, French, and German Phonetics*; T. G. Tucker, *Introduction to the Natural History of*

Language; E. Sievers, *Grundzüge der Phonetik* (full bibliography).

Pho′nograph. See *Gramophone.*

Pho′nolite, a translation into a Greek form of the quarryman's term 'clink-stone', given to certain compact fissile trachytic lavas that rang, as slates do, when struck with the pick. Microscopic research shows that these compact rocks form a special class of trachyte, characterized by the presence of nepheline, leucite, haüyne, nosean, or of all of these, in addition to alkali felspars. Phonolite often forms dome-like masses where it has been protruded in volcanic necks, as in the north of Bohemia.

Phosphate, in chemistry, the generic term for the salts of phosphoric acid (q.v.). They play a leading part in the chemistry of animal and plant life, the most important being the phosphates of sodium, of calcium, and of magnesium. In agriculture the adequate supply of phosphates to plants in the form of manures becomes a matter of necessity in all deplenished soils. These phosphatic manures consist for the most part of bones, ground bones, mineral phosphates (apatite, phosphorite, coprolites), basic slag, superphosphates and reduced superphosphates (both prepared by treating broken-up bones with sulphuric acid), bone-ash, and phosphatic guano. See *Soils and Manures*; *Bone Manure*; *Phosphorus.*

Phosphatic Diathesis is a constitutional predisposition of the body tissues to the formation of the phosphates of magnesium, ammonia, and calcium, seen by their being deposited in the urine.

Phosphores′cence, a term commonly applied to the emission of light by bodies which are not obviously undergoing combustion. The effect is now included under the more general name 'luminescence'. When the emission of light is accompanied by chemical action, it is termed *chemiluminescence,* as when phosphorus oxidizes slowly in moist air. Light of this nature is emitted by glow-worms and fire-flies, by those marine organisms which cause phosphorescence in the sea, by certain deep-sea fishes, and by decaying fish and rotten wood. When a body becomes self-luminous as the result of being exposed to light, the effect is called *photoluminescence.* If the body is self-luminous only while receiving the light rays, the effect is termed *fluorescence* (q.v.); if the luminosity persists after the exciting radiation has been withdrawn, the luminosity is called *phosphorescence,* and the effects may last, in different substances, from a fraction of a second to several weeks. This property is possessed by the sulphides of calcium, strontium, and barium, especially when prepared with a small addition of bismuth, copper, or manganese. The well-known Balmain's luminous paint consists chiefly of calcium sulphide with a small addition of bismuth. Such material is used on the dials of watches and magnetic compasses to make them visible in the dark. Phosphorescent bodies become less luminous when cooled; but some substances, such as ivory, paper, and feathers, only become phosphorescent when cooled to the temperature of liquid air (−190° C.). *Thermoluminescence* is the name given to the luminous glow observed, for example, in fluorspar when gently heated in the dark. *Triboluminescence* is that variety of light emission which is caused by mechanical action, and which is seen when a lump of sugar is crushed in the dark, or when two pieces of quartz are rubbed together. *Electroluminescence* is sometimes seen as a glow in a gas through which an electric discharge has passed, or in the glow of a diamond or ruby after being subjected to the action of kathode rays. *Crystalloluminescence* may be observed in arsenious acid as the substance crystallizes from a solution in hydrochloric acid.

Phosphoric Acid, or Ortho-phosphoric Acid, (H_3PO_4), a tribasic acid obtained by oxidizing red phosphorus with nitric acid, or on the large scale by decomposition of *bone ash* (mainly calcium phosphate, $Ca_3(PO_4)_2$) with sulphuric acid. By evaporation of a solution of ortho-phosphoric acid in vacuo over sulphuric acid, it may be obtained in colourless crystals of melting-point 38·6° C., but usually it is a thick, syrupy liquid. If heated for some time above 215° C., ortho-phosphoric acid loses water, and is transformed into meta-phosphoric acid or glacial phosphoric acid, (HPO_3), a deliquescent vitreous solid. A dilute solution of phosphoric acid is used in medicine, chiefly as a gastric stimulant and to quench thirst. The acid is comparatively inactive, and can be given internally in fairly large doses.

Phos′phorite, a name for massive calcium phosphate, which may be apatite from veins, or concretionary, as in Southern Russia, or a replacement of extensive beds of limestone, as in Northern Africa. Phosphorite with more than 28 per cent of phosphorus pentoxide is valuable as an agricultural fertilizer.

Phosphoroscope, an instrument designed by Becquerel to test bodies which are phosphorescent only for a very short period after exposure to light, such as Iceland spar and uranium compounds. By its means many substances hitherto unsuspected of phosphorescence have been proved capable of remaining luminous for very short periods. The name is also given to a philosophical toy for showing phosphorescent substances in the dark.

Phosphorous Acid, (H_3PO_3), an acid produced by exposing sticks of phosphorus to moist air, and in several other ways. Phosphorous acid exists usually in the form of a thick uncrystallizable syrup, but it may also be obtained crystallized. It is a powerful reducing agent, and precipitates gold and silver from solutions of their salts.

Phos'phorus (symbol, P; atomic weight, 31·04), one of the non-metallic elements. It does not occur free in nature, as it very readily combines with oxygen and other substances; in the combined state, however, it is fairly plentiful and very widely distributed. Its most important derivative is *calcium phosphate* or *phosphate of lime*, $Ca_3(PO_4)_2$; this occurs as the minerals *apatite*, *phosphorite*, *coprolite*; also in bones of animals and in soils and plants. It is manufactured from bone or from native mineral phosphate of lime by heating a mixture of the phosphate with silica and carbon in an electric furnace, when phosphorus vapour is liberated and condensed under water.

Yellow phosphorus is a translucent solid, and when pure is almost colourless; it is slightly soluble in water, soluble in ether and carbon disulphide; is easily cut with a knife, and melts at 44·1° C. It is exceedingly inflammable, and oxidizes so readily that it cannot be kept exposed to air but must be preserved under water. If exposed to moist air, it undergoes oxidation and emits a white vapour of alliaceous odour, which appears luminous in the dark. Owing to the inflammability of the substance, it must not be handled or cut in the dry state, as even the heat of the hand may cause it to inflame, and it causes painful burns.

When phosphorus burns in oxygen or rapidly in air, it gives out a bright white light and is transformed into phosphorus pentoxide, (P_2O_5), a white flocculent powder which dissolves in water, yielding phosphoric acid. Phosphorus is chemically very reactive, and combines with most of the elements; with the metals it forms the *phosphides*, e.g. calcium phosphide, (Ca_3P_2).

Yellow phosphorus was chiefly used for the preparation of lucifer matches, but, owing to the dangerous nature of the element and its harmful effect on the workers, its use was discontinued, and where lucifer matches are manufactured the sulphide of phosphorus, P_4S_3, is used. See *Matches*.

Phosphorus presents a good example of an allotropic element; the second modification is known as *red phosphorus* or *amorphous phosphorus*. Red phosphorus is made from the yellow variety by keeping the element heated for a considerable time to a temperature of 200° to 300° C. out of contact with air. The yellow waxy solid is slowly changed into a red powder. This red modification has properties very different from the yellow variety; thus it is insoluble in carbon disulphide, it may be left exposed to air, and it does not catch fire. Yellow phosphorus is exceedingly poisonous, red phosphorus is non-poisonous. The red variety is used for the preparation of safety matches—phosphorus being one of the ingredients of the striking surface. If kept heated to its boiling-point, it changes back to the yellow modification.

Pho'tius, Byzantine theologian and scholar, born at Constantinople (about 820) of patrician parents. He became Secretary of State under the Emperor Michael III, and was intimate with the minister Bardas, uncle of the emperor. On the deposition of the patriarch Ignatius, the emperor raised Photius to the patriarchal dignity. This was opposed by Pope Nicholas I, whom Photius excommunicated, thereby laying the foundation of the schism between the Eastern and Western Churches. But the Emperor Michael having been murdered in 867 by Basil, who was raised to the throne, that prince immediately replaced Ignatius, and banished Photius, who, however, resumed his dignity on the death of Ignatius in 878. On the accession of Leo, son of Basil, to the imperial throne in 886, Photius was again deposed, and banished to a monastery in Armenia, where he died in 891. Photius was an able ecclesiastical statesman, and a man of great intellect, erudition, and literary power. His chief work is the *Myriobiblon*, a sort of review of 280 works which he had read, and most of which are now lost. He also wrote a theological work, *Amphilochia*, and compiled a lexicon of the words occurring in the Greek orators and historians.

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